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*Cover Photograph*

The repair shop on Lord Iveagh's estate, Elveden, Suffolk.

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# AGRICULTURE

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## MORE STORES FROM AUTUMN-BORN CALVES

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Contrary to some farmers' opinions, autumn-born calves are not more costly to rear than spring calves, and may indeed secure a better return.

CURRENT agricultural policy places considerable emphasis on the output of meat from United Kingdom agriculture. With regard to the beef industry, the fundamental problem is the procurement of sufficient suitable stores for fattening, which, in turn, depends upon the production of an adequate supply of beef-type calves from the national herd. It is envisaged that there will be an increase of beef cattle production in the rearing areas, due to the return of some upland and marginal lowland milk producers to rearing store cattle, and to a general intensification of existing beef cattle enterprises. To meet this situation, more beef-type calves will have to come from dairying areas in the lowlands. It is obvious that the first-class dairy farms with attested herds of pure dairy type can be ruled out, but what of the hundreds of other farms where the herds consist of dual-purpose or cross-bred cattle? To these, the A.I. centres, giving a ready supply of beef semen, are of extreme importance. To have some of their lower-yielding cows inseminated by a beef bull, particularly one of the colour-marking breeds, would go a long way towards achieving the numbers of beef-type calves required. The calves will, of course, have to be given a good start and kept for a few weeks on the dairy farms until they are strong enough to travel fairly long distances to the rearing areas.

This practice of raising beef-type calves is growing steadily in the dairying areas of the western part of the country, particularly on farms that have discontinued rearing dairy replacements until their herds are attested. To judge from the price of a good young Hereford or Devon calf at the store market, it is undoubtedly a profitable sideline at the present time.

It is believed that the majority of suitable spring calves are already being reared, and since a considerable proportion of cows in dairy herds calve in the autumn months, the solution of the problem of obtaining more calves for beef lies in the salvaging and rearing of a greater number of these autumn-born calves. Whether or not this will be done depends mainly on the economics of rearing these autumn calves. It is often stated that calves born in the autumn, after their dams have been out at grass in the open air and sunshine, are healthier and easier to rear. But in spite of this many farmers still think that an autumn-born calf is more costly to rear than a spring calf.

**Comparing Rearing Costs** The figures given in Table 1, taken from a report on the costs of rearing on Welsh farms (1), bring out some interesting facts concerning the costs of rearing autumn and spring calves. From this data it would appear that an autumn-born calf was about £6 cheaper to rear up to two years old than a spring-born calf. Looked at in another way, a strong, 2½-year-old, autumn-born store marketed at the spring sales would, according to this table, have cost no more to rear than a two-year-old, spring-born store at the same sale, but it should fetch more than the less advanced spring-born animal. The conditions under which it had been wintered would, of course, determine how much further forward it would be.

**Table 1**
**Comparative Costs of Rearing Spring- and Autumn-born Calves**

| | Spring-born Calf | | | Autumn-born Calf | |
|---|---|---|---|---|---|
| | Spring 1946 to Spring 1948 | Spring 1947 to Spring 1949 | Spring 1948 to Spring 1950 | Autumn 1946 to Spring 1949 | Autumn 1947 to Spring 1950 |
| | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Up to 6 months | 10 10 7 | 12 4 8 | 11 18 8 | 13 10 5 | 12 18 0 |
| 6 to 12 „ | 7 6 11 | 8 2 0 | 7 19 0 | 3 1 9 | 2 18 9 |
| 12 to 18 „ | 2 6 8 | 2 14 2 | 2 7 9 | 8 5 6 | 6 8 10 |
| 18 to 24 „ | 7 11 1 | 9 8 11 | 8 12 1 | 2 1 3 | 2 6 2 |
| **Total (24 months)** | 27 15 3 | 32 9 9 | 30 17 6 | 26 18 11 | 24 11 9 |
| 24-30 months | | | | 6 5 6 | 7 9 5 |
| **Total (30 months)** | | | | 33 4 5 | 32 1 2 |

The main explanation for the autumn-born calf being cheaper up to two years old lies in the fact that a calf is hand-fed (apart from suckled calves) for most of the first six months of its life. At the end of this time an autumn-born calf can be turned out to grass, but a spring-born calf at six months old faces yet another six months of winter hand-feeding and housing. Admittedly, young calves can be turned out to grass for short periods when they are four or five months old, provided due care is taken, and so the spring-born calf could be out for a little while in its first year; but the main point is that it is the incidence of winter months, involving hand-feeding and housing, which will primarily affect the cost of rearing.

Prices prevailing for the last two years can be applied to the physical data on which the costs in Table 1 are based. For a store beast entering the spring sales in 1954, the difference in relative rearing costs still appears to hold good.

Examining the costs up to eighteen months old, shown in Table 2, it will be seen that the advantage to be gained with the autumn-born calf is not so pronounced at this stage. It is the question of the incidence of summers and winters again; for the autumn calf is on hand for two winters and one summer, whilst the spring calf is on hand for one winter and two summers (one of which is the costly first six months). It is also obvious from these data on rearing costs that a substantial proportion of the total costs are incurred during the first few months of the calf's life. Yet most rearers would agree that it is false economy to cut down on the calf's feeding in these early stages, and that the successful results from the rearing enterprise as a whole are based largely on the start the calves get. This view is borne out by the results of the Cambridge beef experiments.

In computing the cost data, the milk given to the calves has been charged at an average cost of production determined by a separate investigation. Spring calves tend to receive larger quantities of milk than autumn-born calves, offsetting to some extent the lower costs of production of milk in the summer. But on milk selling farms the milk fed to calves also has an "opportunity", or alternative use value, namely, the price it would fetch in the liquid market. If this value is taken into account the average costs of rearing will be higher, and the relative costs of rearing autumn and spring calves may be affected.

**Table 2**

**Comparative Costs of Rearing projected for 1952-54**

| | Spring-born Calf | Autumn-born Calf |
|---|---|---|
| | Spring 1952 to Spring 1954 | Autumn 1951 to Spring 1954 |
| | £ s. d. | £ s. d. |
| Up to 6 months | 16 16 0 S | 17 13 0 W |
| 6 – 12 „ | 12 12 0 W | 3 18 0 S |
| 12 – 18 „ | 3 6 0 S | 10 7 0 W |
| 18 – 24 „ | 13 2 0 W | 3 4 0 S |
| Total (24 months) | 45 16 0 | 35 2 0 |
| 24 – 30 months | | 10 1 0 W |
| Total (30 months) | | 45 3 0 |

S = Summer W = Winter

Further evidence on the cost of raising spring- and autumn-born calves is provided by a report on the rearing of store cattle in Devon and Cornwall (2). Here, the average cost of rearing a store up to two years in the 1951–53 period was £40 16s. 9d. and £41 9d. 3d. for the spring- and autumn-born calves, respectively. Thus it appears that in the South-West the two types of stores cost about the same to rear.

**Probable Returns** The demand for store cattle depends upon many factors and may fluctuate widely. The Ministry of Agriculture's monthly quotations of store cattle prices give some details of breeds and age groups, but the prices of good, strong, colour-marked stores may move in a different manner to the prices of inferior quality, nondescript animals. It is also apparent that there is usually a seasonal rise in price in the early summer and autumn months, as opposed to the winter and early spring months, but during the last few years these seasonal fluctuations have been masked by all-round price increases.

Apart from a brisk trade in young calves at a few weeks old, store cattle are not usually sold under about eighteen months old, because until then it is generally considered that the production cost is out of proportion to the value of the store. Unless one is dealing with the actual costs, returns and margins on a specific, well-defined sample of farms, it is not always easy, and sometimes by no means safe, to show average costs and returns of a single enterprise considered in isolation. However, Table 3, which is built up on various assumptions, brings out some of the main points to be considered in regard to the question of the cost of production and the returns to be expected from autumn- and spring-born calves. It must be emphasized

again that the figures in the "estimated margin" column should not be taken as the absolute margin, and that they are shown here only for comparative purposes. The assumptions relating to costs are based on the figures given in Table 2.

It would appear from these calculations that a two-year-old, spring-born store will cost about £43 to produce, and an autumn-born store will cost only a little more at 2½ years old. Similarly, the two-year-old, autumn-born store will be about £5 cheaper to rear up to this age than the spring-born calf. In the value column it is assumed that an average price for a two-year-old beast at the spring sale would be £60, but a two-year-old beast at an autumn sale would not be quite so highly priced. A similar argument could apply to the eighteen-months-old animal.

**Table 3**

**Comparison of Estimated Production Costs, Market Values, and Margins.**

| | Estimated Cost of Production | Sale Time | Estimated Market Value | Estimated Margin per Beast |
|---|---|---|---|---|
| | £ | | £ | £ |
| *Spring-born calf* | | | | |
| 18 months old | 32 | Autumn | 40 | 8 |
| 24 " " | 43 | Spring | 60 | 17 |
| *Autumn-born calf* | | | | |
| 18 months old | 32 | Spring | 45 | 13 |
| 24 " " | 38 | Autumn | 55 | 17 |
| 30 " " | 45 | Spring | 65 | 20 |

Bearing in mind the various assumptions made, three points can be noted from this reasoning:

1. The autumn-born store at eighteen months old is available for the spring sales, and, since production costs are about the same, may therefore be more profitable than a spring-born store sold at the same age—that is, in the autumn.
2. At two years old the spring-born store is available for the spring sales, but probably costs more to produce than the autumn-born store of the same age, and so may be no more profitable.
3. If the autumn-born animal has to be carried on in store condition to 2½ years old to come round to the spring sales, the stock-carrying capacity of the farm for the younger age groups may be reduced. From the point of view of total farm income, this factor has to be balanced against the probable increase in return by keeping the store for the extra six months.

**Autumn Calves are just as Profitable** To sum up, it is evident that an increase in home beef production will depend largely on a greater supply of beef-type calves from the national dairy herd. There is some evidence to support the view that most of the more suitable spring calves are already being reared, and that autumn-born calves from dairy herds will form the bulk of additional supplies. It is suggested that semen from colour-marking bulls should be used more widely to improve the quality of these calves. The economic data available suggest that the autumn-born store compares favourably with the spring-born animal from the point of view of costs, margins and profitability.

The rearing of these autumn calves to a marketable age should not only meet the demand for more store cattle, but also provide the dairy farmer with a useful source of additional income. The greater supply of suitable calves

for rearing, together with increased grassland productivity, should also provide the means of intensifying production on the rearing farms and lead to higher farm incomes. At the same time, the expansion of our home beef supplies may achieve the levels which national circumstances demand.

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# CONTROL OF YELLOWS IN SUGAR BEET SEED CROPS IN GREAT BRITAIN

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The following article, which summarizes the various efforts made since 1951 to reduce the incidence of Virus Yellows in sugar beet seed crops in Great Britain, was originally presented by Dr. Hull to the Sixteenth Congress of the International Institute of Sugar Beet Research, held in Brussels earlier this year.

THE acreage of sugar beet seed crops in Great Britain increased rapidly after 1935, and since 1940 almost all the country's requirements of seed have been produced at home on some 3–5,000 acres. Sugar beet seed crops, like mangold seed crops, are grown only in the eastern parts of England, where most of the mangold and sugar beet root crops are also grown. Stecklings are sown in July or early August; some are transplanted in the autumn, others are left *in situ* over the winter and transplanted in the spring. Frost sometimes causes serious losses in autumn-transplanted fields, but is seldom severe enough to necessitate clamping stecklings, as is the common practice in Continental countries.

Experiments on the control of Virus Yellows in seed crops were started in 1940, because the disease was obviously spreading from seed crops to nearby root crops, and the worst outbreaks of yellows generally occurred in seed-growing areas. Also, seed crops with yellows gave poor yields, and the almost annual recurrence of the disease was making the crop uneconomic. The experiments (1) showed that in most years yellows was less prevalent in stecklings sown in August than in those sown in July, but also that there was a risk that the late-sown plants would not grow big enough for transplanting.

In some further experiments (2) it was found that spraying stecklings in the autumn with persistent and systemic insecticides reduced the percentage of plants with yellows to one-tenth of that on untreated plots. In other experiments, however, plots sprayed as many as six times gave 90–100 per cent infected plants. Thus, although spraying might be worth while in some years, it would not in others. Good control was obtained by sowing the stecklings in April under a cover crop of barley, and the percentage of plants infected when grown in this way was only about one-tenth of that

when they were grown in open beds in the same field. In years when open beds in the east of England were giving many infected stecklings it was also shown that healthy stecklings could be produced in the north of England, in parts of Scotland, and in other places remote from areas of intensive sugar beet growing.

The eleven firms producing sugar beet seed in England, in agreement with the British Sugar Corporation, for whom all the seed is grown on contract, decided to adopt control measures against yellows on all their steckling beds for the 1951 and subsequent harvests. A proportion of the stecklings is sown in isolation areas, and the remainder, mostly situated in eastern England, is sown under cover crops or is sprayed. As an additional precaution—for none of the control measures is infallible—a steckling certification scheme has been adopted. Inspectors seconded from the National Agricultural Advisory Service and the agricultural staff of the British Sugar Corporation, who have attended training courses at Dunholme Field Station, inspect and report on the steckling beds. They work in pairs and a representative of the seed firm is invited to accompany them. The percentage of plants infected with Virus Yellows in each steckling bed is assessed at the end of October. Plant population is assessed by counting the total plants in one-yard lengths of row at twenty random positions in each bed. The number of plants with yellows is counted in twenty 10-yard lengths of row, and from these data the percentage of infected plants is calculated.

Samples of plants from all steckling beds are planted in plots at Dunholme, so that the proportion of plants infected in the second year may be checked against that recorded in the steckling bed. Beds showing more than 10 per cent of plants with Virus Yellows are condemned, those showing less than 1 per cent are certified as satisfactory for planting, those with between 1 and 10 per cent Virus Yellows are used only if they are needed to give the required area of seed crops as agreed between the seed firm and the British Sugar Corporation. These arrangements have meant a change in the organization of seed growing, for now the seed firms undertake to supply farmers with certified stecklings instead of with seed to grow their own stecklings.

**Growing Stecklings in Isolation** The areas chosen for growing stecklings are those which, because of elevation, climate and cropping are relatively unfavourable for the movement of aphids and the spread of yellows, and which are thinly cropped with mangolds and sugar beet. For instance, only 0.2 per cent of the surface area of the counties of Durham and Northumberland, where most of the isolated beds of stecklings are grown, is cropped with mangolds, sugar beet and related crops, whereas as much as 7–10 per cent of the surface area of some of the counties where other seed crops are grown are planted each year with these root crops. Furthermore, the incidence of yellows in the few root crops grown in these isolation areas is low. The average over five years has been less than 3 per cent, compared with 40 per cent in the main seed-growing area in south Lincolnshire.

Within a major area chosen for steckling production, geographical, climatic and agricultural conditions vary considerably, and a compromise has to be made in choice of site between farms which are best for avoiding virus infection, but where other factors often make it difficult to grow stecklings satisfactorily, and those where the risk of infection is often greater but which are more favourably situated and equipped for growing and harvesting stecklings. So far, the north of England has been the main source of isolated steckling beds, and has produced satisfactory results.

Some infected plants have occurred but the beds have been consistently satisfactory each year. The good results undoubtedly depend on the areas containing very few sources of the virus, for aphids are present, sometimes in large numbers. In the summer of 1952, for example, steckling beds in Northumberland were so heavily infested that the plants in some late-sown beds were killed; nevertheless, the mean yellows infection in crops planted from the beds in this area was only 4.1 per cent. Such happenings show that the greatest care is needed to keep the area free from infected plants.

Results in other areas have been more variable. The percentage of stecklings with yellows from Wales and parts of central England, for instance, has been low in most years, but has occasionally been very high. Although in these areas farms can be chosen which have no beet or mangold crops within several miles, severe outbreaks of yellows in stecklings grown there suggest that many infective aphids drift to them from the main beet-growing areas, perhaps some 50 miles or so away.

The difficulties of transporting stecklings from isolation areas and organizing their supply to seed growers have largely been overcome. Between a third and a half of all steckling beds have been grown in these areas over the last four years. One firm of seed producers alone has planted about 1,000 acres of seed crops with plants from isolated areas each year since 1951.

**Spraying Steckling Beds** Most steckling beds grown in eastern England have depended on spraying with insecticide for controlling yellows. The insecticides generally used are parathion, schraden and dimefox, or mixtures of these compounds. Spraying at intervals of two or three weeks is recommended, which would mean six treatments in the season, but often only two or three are applied. For three years most sprayed steckling beds were certified as satisfactory, and spraying doubtlessly helped to ensure that the final level of infection in the planted seed crop was not above 2 per cent (see the table on p. 209). In the fourth year (1953), however, the results were not satisfactory. Twenty-eight out of forty-seven sprayed beds had more than 1 per cent infected plants when inspected in October, and the mean percentage infection for all sprayed beds was 2.6 per cent.

Spraying failed to control yellows in steckling beds in 1953 for two reasons. First, the stecklings were colonized with winged aphids immediately they emerged and before they were big enough for spraying. Furthermore, the soil was dry, so that germination was erratic, and growers were reluctant to spray until there was a full braird. In the meantime, aphids had colonized and infected the plants which had emerged first, so that sources of virus were distributed throughout the braird. Under these circumstances regular spraying could not prevent spread of yellows by winged aphids within the bed. Secondly, root crops of sugar beet and mangold were colonized late with aphids, and many apterae developed on them during July and early August. It was these winged aphids which invaded the germinating stecklings. It is unlikely that any insecticide in use at present would prevent considerable infection with yellows occurring in such circumstances.

It is interesting to compare the two years 1952 and 1953. In both years sugar beet crops were heavily infested with *Myzus persicae*. In 1952, however, the peak infestation occurred in June. This was bad for the root crop, but stecklings remained comparatively free from virus, because there were few aphids by the time stecklings had germinated. In 1953 the peak infestation of the root crop occurred in July, and migrants from this crop went directly to stecklings at the end of July and in early August. Yellows has

been prevalent in steckling experiments at Dunholme in years when aphid infestation of the root crop has been late, or never reached a well-defined peak but persisted at a moderate level throughout the summer. It is in these circumstances also that spraying has failed to control yellows in stecklings.

**Cover Crops** Very good control of yellows has been obtained by raising stecklings under cover crops of barley, and spraying the stecklings with insecticide after the barley has been harvested. This method of control has been adopted on a large scale in Essex, the seed-growing area furthest from the best isolation areas in the north of England. Possibly it succeeds best in this southern area because the peak aphid population generally develops earlier than is the case further north. The cover crop is not harvested until aphid numbers have dwindled, and hence stecklings tend still to be protected when the viruliferous aphids migrate from the root crop. As a routine practice to prevent aphids developing in the autumn, the steckling are sprayed with an insecticide after the cover crop has been cut. There have been no serious failures with this method and the few beds with much yellows could usually be attributed to a partial failure of the cover crop so that the stecklings were virtually in an early-sown, open bed.

This method of control entails practical difficulties of getting the correct balance of growth between cover crop and stecklings. A number of beds have failed because the cover crop has been too dense. Conversely, when the cover crop is too thin, the stecklings become infected with yellows. It is not considered to be a suitable method for the more fertile, fenland soils, where the cover crop grows so strongly that it smothers the stecklings.

**Certification of Steckling Beds** There are several difficulties in examining stecklings for a certification scheme. First, there is the problem of recognizing infected plants. This is not too great in late-sown, well-fertilized beds, but is considerable in undersown beds or those planted early in which the nutrients and moisture have been exhausted, resulting in a lot of yellowing of the foliage. Training, practice, and checking one man's counts against another, are the methods used to ensure reliable results. Secondly, it is our experience that individuals in any group of people coming freshly to the job will obtain very different results if asked to count the number of usable plants (that is, plants with a crown diameter more than 3/8 inch) in a given length of row; consequently, all our counts are now based on the total number of plants, whatever the size. Thirdly, there are the errors which inevitably arise in sampling a steckling bed. We have endeavoured to overcome the first two difficulties by training, and there is evidence that over the four years when inspections have been done the standard has become more uniform. The solution of the third is to compromise between what is desirable and what is practical.

The procedure for making the counts has been described earlier. We are usually aiming at assessing whether the bed contains more or less than 1 per cent infected plants, and by counting the number of virus-infected plants in a length of row ten times greater than the length on which the total plants are counted, we get a more accurate assessment of the low levels of infection usually encountered in our steckling beds. This method is not satisfactory, however, for assessing higher levels of infection. This year we found that for infections higher than 10 per cent it was better to count the total number of infected plants in one-yard lengths of row; then the results are some 20–30 per cent higher than when the infected plants are counted on greater lengths of row.

As might be expected, the relationship between counts of infected plants in steckling beds and in seed crops are not close. Hence it is essential to have a flexible scheme whereby steckling beds showing levels of infection between 1 and 10 per cent are not condemned immediately. Seed firms are not usually prepared to take the risk of using plants from such beds, but they generally have enough certified plants to cover their needs. Where this is not so, the acreage of seed crop planted from beds with infections greater than 1 per cent is limited and carefully located.

**Incidence of Virus Yellows in Sugar Beet Steckling Beds and Seed Crops in Great Britain, 1950–54**

| Control Measure | | No. of Beds | Percentage of Plants with Virus Yellows | |
|---|---|---|---|---|
| | | | Steckling Bed | Seed Crop |
| 1950-51 | | | | |
| Isolation | All beds | 76 | — | 0.95 |
| Sprayed | All beds | 6 | 0.21 | 0.90 |
| Cover crop | All beds | 66 | 0.21 | 0.34 |
| Mean | All beds | 148 | — | 0.68 |
| | Spray and cover crop only | 72 | 0.21 | 0.39 |
| 1951-52 | | | | |
| Isolation | All certified | 31 | 0.05 | 0.36 |
| Sprayed | All certified | 39 | 0.17 | 1.9 |
| Cover crop | All beds | 43 | 0.21 | 1.4 |
| | Certified beds | 42 | 0.03 | 0.4 |
| Mean | All beds | 113 | 0.15 | 1.3 |
| | Certified | 112 | 0.09 | 0.9 |
| 1952-53 | | | | |
| Isolation | All certified | 34 | 0.25 | 4.1 |
| Sprayed | All beds | 40 | 0.88 | 5.6 |
| | Certified beds | 37 | 0.21 | 2.0 |
| Cover crop | All beds | 29 | 0.50 | 2.7 |
| | Certified beds | 25 | 0.21 | 1.3 |
| Mean | All beds | 103 | 0.56 | 4.3 |
| | Certified beds | 96 | 0.22 | 2.6 |
| 1953-54 | | | | |
| Isolation | All beds | 29 | 0.81 | 10.5 |
| | Certified beds | 24 | 0.50 | 7.8 |
| Sprayed | All beds | 46 | 4.28 | 25.2 |
| | Certified beds | 20 | 0.30 | 4.1 |
| Cover crop | All certified | 11 | 0.11 | 2.5 |
| Mean | All beds | 86 | 2.57 | 17.4 |
| | Certified beds | 55 | 0.35 | 5.4 |

The certification scheme, therefore, sifts out the satisfactory, the doubtful and the unsatisfactory beds. The unsatisfactory ones are discarded. The effect on the general level of yellows infection in seed crops is shown in the table. In 1950 and 1951 all stecklings were accepted for planting. In 1952-53, the mean level of infection in the seed crop was almost halved by discarding seven steckling beds. In 1953–54, the mean infection in certified steckling beds (including the few over 1 per cent which we re-used for planting) is less than one-seventh of the mean infection for all steckling beds, certified

and condemned. Discarding these stecklings has cut out most of the heavily infected crops. The worst crop from certified stecklings had 34 per cent of infected plants, and all but six had less than 10 per cent. Small plots planted from the non-certified beds gave up to 100 per cent infected plants, and all except three had more than 10 per cent. Average yellows infection was reduced from 17.4 per cent for all beds to 5.4 per cent for certified beds.

**Results of Control Measures** Since the scheme of control measures was introduced in 1950 commercial sugar beet seed crops have been almost free from yellows. Weather and other natural influences have played some part in giving this result, but the control measures and certification scheme have also been important. In some years their share can be seen by the difference in health between sugar beet and mangold seed crops; in contrast to the freedom of sugar beet, yellows occurred regularly in mangold seed crops, in which control measures have been less thoroughly applied. The difference is likely to be more outstanding this year, for mangold steckling beds were obviously heavily infected in some districts in the autumn of 1953 and infection in mangold seed crops is likely to be very heavy this year.

The efforts of sugar beet seed producers to control yellows have produced their direct reward. When control measures were introduced the mean yield of seed rose from 7-12 cwt. per acre in the previous four years to 15.5 cwt. per acre in 1951. Since 1951 mean yields have remained constantly between 15 and 20 cwt. per acre. One firm writes that since adopting control measures their mean yield has increased from less than 9 cwt. per acre to an average of over 23 cwt. per acre for the last three harvests, and that the seed produced is an embarrassment! Apart from increased average yields, control of yellows is worth while if it reduces the wide fluctuations in yield which were previously common, thus making assessments of acreage requirements more reliable.

Ensuring that 3-4,000 acres of seed crop, grown in the midst of the densest and most fertile root crop areas, are no longer a source of yellows, cannot but benefit the health of the root crops. Kesteven and parts of the Holland division of Lincolnshire are among the chief sugar beet seed areas and, up to 1949, one of the districts where yellows was most severe in root crops. Since the introduction of control measures in seed crops, yellows has not been serious in this area, even when it has been prevalent elsewhere. Thus so far the facts conform with the hope that these efforts of the sugar beet seed producers have had material beneficial results.

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# GOOD ESTATE MANAGEMENT

## BOUGHTON

### THE NORTHAMPTONSHIRE HOME OF HIS GRACE THE DUKE OF BUCCLEUCH

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THE Boughton Estate of His Grace the Duke of Buccleuch lies just north of Kettering and consists of some 11,000 acres, including 2,000 acres of woodland and a home farm of 1,090 acres, 300 acres of which are parkland. It contains thirty sizable farms, some smallholdings and 260 cottages, mainly built in typical Northamptonshire stone with varying roofings. About 80 are thatched and maintained by thatchers on the estate staff and others have local Collyweston slates.

The estate was acquired in 1528 by Sir Edward Montagu, afterwards Lord Chief Justice of England. He was succeeded by his son and grandson. The latter was created Baron Montagu in 1621 and is remembered as the mover of a resolution in the House of Lords to keep the anniversary of the Gunpowder Plot as a national festival. His grandson, Ralph, who was created first Duke in 1705, carried out extensive alterations on Boughton House, many of them based on the Palace of Versailles, where he had been Ambassador Extraordinary. The house is still as he built it, though the elaborate gardens he laid out are now more modest than in those spacious days. However, this is not the place to describe the beautiful rooms, exquisite period furniture, tapestries and carpets, and other art treasures of this famous mansion. Duke Ralph's son married a daughter of John Churchill, the great Duke of Marlborough, and their daughter and heiress married the fourth Earl of Cardigan who, in 1766, was created Duke of Montagu. It was the marriage of the Duke's daughter Elizabeth to the third Duke of Buccleuch in 1767 that brought about the merger of the Montagu possessions at Boughton with those of the Duke of Buccleuch.

**Estate Office and Buildings** Mr. J. L. M. Sinnett, B.A., F.L.A.S., the resident agent, has the assistance of a head clerk, two assistants, and normally one or two pupils. Full records are kept, including a comprehensive Estate Terrier and, in conjunction with this, a cropping schedule for each field. It is Mr. Sinnett's practice to visit each field once a year during the early autumn, thereby keeping the cropping record up to date and helping to ensure that a high standard of husbandry is being maintained by each tenant.

Detailed costings are kept of all work carried out by estate workmen, and from the detail sheets one can find the expenditure on any one property over a period of years. Any unused materials are noted on the reverse side of the job card and are set off against the materials drawn from the estate yard for the job.

Detailed costings are also kept for the woodlands, and their profitability or otherwise is easily determined. Records are available to show all tile and mole drainage systems on various parts of the estate.

The Clerk of Works has a staff of two foremen, one in the workshops and one for outside work, four masons and mates, eight carpenters and two

plumbers. Contract labour is also used occasionally; all the painting is, however, done in this way, the estate supplying the paint. Costings show that repairs done by direct labour are very considerably cheaper than those done by contract.

**The Woodlands** Any account of the Boughton Estate would be incomplete without reference to the large area of woodland. The woods and sawmill are under the competent management of a Head Forester, who has a staff of three foremen and thirty-seven men.

From the forestry point of view the principal features of interest on the estate are the avenues famous for two hundred years, the four large woods (comprising together 1,670 acres), the ironstone plantations (150 acres), the "Wilderness," other smaller plantations, and the estate hedges.

There are many avenues of historic interest which beautify the landscape, and their presence can, in the main, be accounted to John second Duke of Montagu, who died in 1749. To this day he is affectionately known as "John the Planter". It was his ambition to plant an avenue of trees from Boughton to London, a distance of 75 miles, but, unable to acquire the freehold of the land, he changed his programme to the planting of a comparable mileage within the estate. Broad Walk, the earliest of these avenues, leading west from Boughton House, is shown on maps of the estate in 1717. It is over 100 yards wide, and travellers on the main Kettering to Stamford highway will see Boughton House framed by the trees. The other avenues are shown mostly on maps of the estate dated 1748.

With one important exception, the avenues consist almost entirely of majestic elms. This exception, the Lime Avenue, leading southward from Boughton House, is 1½ miles long and can be seen where it crosses the road at the top of the hill after leaving Warkton village towards Grafton Underwood.

The Boughton Estate woodlands, lying approximately 2–4 miles north and north-east of Kettering, are mainly hardwoods. There are four principal woods: Geddington Chase, Old Head Wood, Grafton Park and Weekley Hall Wood, situated on boulder clay and growing in the main oak standards over hazel and ash coppice. The woods are divided by numerous rides into suitable compartments.

The objects of management are to grow good quality timber in as economical a manner as possible and to maintain and manage the existing woodlands by correct silvicultural practices. With this aim in view there has been a continuous forestry policy for many years, based on three rules: the production of good timber for estate purposes and for sale; the encouragement of natural regeneration; and the extermination of rabbits, which has to a great extent been successful. A total of 1,856 acres, mostly oak standards with coppice underneath, have been dedicated.

The policy for the last fifty years has included selective felling, and, more recently, some clear felling with an emphasis on clearing the poorest coppice, encouraging natural seedlings, supplemented by planting where necessary. Some group planting has been necessary, and ash, oak, beech, larch and sycamore have been used.

Within recent years the mature oaks have shown signs of a more rapid decline due, partly, to their age and the ravages of the Oak Roller moth (*Tortrix viridana*). This infestation has also accounted for poor mast

years, which in turn have impeded the self-regeneration. More recent policy has therefore tended towards clear felling of larger areas where the oak will not permit of further selective fellings, and these areas are being replanted mainly with oak or ash, with European larch as a nurse crop. The larch will be thinned regularly and used for estate purposes, or sold for pit-props. The final crop will, it is hoped, be hardwoods containing, in addition to other species, some beech, introduced as soil improvers. During the last twenty-five years serious damage has been caused to beech and sycamore by grey squirrels.

A fairly constant annual supply of timber is required to feed the estate sawmill. This is provided by felling deteriorating trees, whether in woods, park, avenues or hedgerow, and where selective felling in the main woods is no longer practicable, by clear felling followed by replanting. Care is taken to see that the volume of timber felled annually does not exceed the estimated increment of the woods, and that in addition a planting programme of some 100,000 trees a year will maintain the acreage and constant economic condition of the woods.

The ironstone plantations amounting to nearly 150 acres were created to make use of the land which in the past has been worked out by ironstone opencast mining and left derelict; the earliest plantation dates from 1909. The land was left in hill and dale and the soil was solid clay, rock or sand, or a mixture of all three. The planting of such ground was at first quite experimental and a big variety of species was tried. As a result of some forty years experience, larch, sycamore, oak and ash are the species most used. There is no humus or surface soil and neighbouring trees are, as likely as not, planted in completely different soil conditions. The drainage is usually free and assists in the establishment of young trees in these difficult conditions.

It is now the policy, however, to rough level the ridge and dale before planting, where it is decided that restoration will not make it suitable for agriculture. By recent experiments over an area of about 80 acres where the top soil was lost during war-time mining, it is hoped to prove that much of this old worked ironstone land can be restored successfully and returned to agriculture, although the cost of so doing is high.

**The Wilderness** This plantation, consisting of 22 acres, is a very interesting example of hardwoods of different species and ages. There is much natural regeneration of ash, sycamore, oak, beech and elm, and this is supplemented by some planting with ash, sycamore, walnut, beech and oak. The plantation has been favourably commented upon and received the Gold Medal for the R.A.S.E. Competition in 1953.

An unusual feature is that the roadside hedges in addition to the woodland hedges are maintained by the estate. This is no small task, for there are 35 miles of roadside hedges and nearly the whole of this length has been laid during the last five years by four men. In the past they were brushed annually, but during the war the work fell into arrears and the hedges were allowed to run up. It is now intended to layer the hedges on a fifteen-year rotation. The most recently layered will be brushed for ten years and then allowed to run up for five years before layering. This will mean that 2½ miles will be layered annually. They are of good Northamptonshire thorn, which will stand hard cutting and makes a first-class stockproof fence. The estate engaged two expert hedge-cutters, and now a Latvian who has been working with them has achieved a high standard of efficiency.

**Estate Sawmill** For many years the oak timber was disposed of by auction, having been felled by estate woodmen and measured after felling. In 1935, however, a sawmill capable of dealing with large trees was erected in Geddington Village. Now practically all timber (except the largest and best quality trees, which find a ready market in the round) is converted for estate use, and the surplus is sold for many and varied purposes—fencing, wagon bottoms, farm gates (of which 1,000 are made every year) elm coffin boards, beams and scantlings, mangers and racks, etc.

Mention should be made here of the ingenious siting of the sawmill, which is on sloping ground. The round timber enters the mill at the top of the slope and is easily rolled down on to the benches for conversion. The finished article is wheeled downhill on tram lines to the loading area, where the timber can be passed direct on to lorries; thus the whole process of conversion is economic in labour.

The machines in use consist of a band saw, a horizontal saw capable of dealing with all but the largest butts, the usual complement of smaller saws for ripping down, and morticing machines.

A staff of eight regular men is employed and all timber is delivered to the yard by estate men and equipment; the equipment consists of an all-steel timber drag hauled by a diesel tractor, with an ex-army tractor held in reserve. Cross-cutting is done entirely by electric chain saws, and the machinery at the sawmill is driven by electric power. All illumination is by strip lighting. The "saw-doctor's" shop has all the most up-to-date equipment and great importance is attached to the saws being maintained in tip-top condition.

**Home Farm** The Home Farm has its own Manager and a staff of twenty men. It consists of just over 1,000 acres of typical Northamptonshire heavy land. Of this area, 250 acres of grain, mostly wheat, are grown each year, as well as some beans, barley and oats.

The main farming activity is milk production from an attested herd of 60 Red Poll cows, allied with beef production from this dual-purpose breed. The herd was formed in 1948 and a modern eight-point milking parlour with concreted assembly and dispersal yards was introduced. The cows are kept during the winter in three covered yards, from which they are taken to the parlour for milking. Strip lighting is installed and the sterilizing equipment is all electric. Recently an in-churn milk cooling outfit has been installed and all milk is now cooled by this method before it leaves the farm.

Although no high-priced cows were bought in 1948, special attention has been paid to purchasing good bulls from dams with first-class milk records; and now that heifers from these matings are coming into the herd, the milk yields are showing pleasing improvements. All calves are reared on suckling cows, and after weaning the heifers and steers are sent to separate buildings. The young cattle are yarded for their first winter, and later the steers live out until sold fat off the grass at three years old. Recently, eleven Red Poll bullocks averaged £94. 2s. each, when sold in Kettering Market.

Four hundred Scottish half-bred ewes are lambed down annually and are mated with either Suffolk or Oxford Down rams, the lambs being sold in the autumn. Each autumn the ewe flock is culled of aged or broken-mouthed ewes and replenished by about one hundred ewe lambs from the Buccleuch Scottish farms.

The Home Farm is equipped with a caterpillar tractor with wide tracks, which, with a four-furrow plough, does most of the ploughing. A bulldozer attachment for the caterpillar tractor is also found useful for estate work. A combine-harvester, a pick-up baler, four heavy wheeled tractors and the usual complement of cultivators, harrows, rolls and haymaking machinery make the home farm well equipped. Steps are being taken to provide storage for a considerable proportion of the grain, and before the next harvest a tray-type drier is to be installed, capable of dealing with 20 tons of grain daily. Five 30-ton silos are being built by estate masons to augment the existing granary accommodation.

The Park of 300 acres no longer carries a herd of deer. They were dispersed in 1948, and the Park was then divided into several grazing areas, well watered by the river Ise. Liberal applications of basic slag and controlled grazing have resulted in a pasture capable of fattening a beast without supplementary feeding. Spraying has also been systematically carried out to control thistles, nettles, buttercups, etc. Thirty acres of the Park were used as an Army camp during the war, but since derequisition it has been cleared of huts, hut-bases and roads, and direct reseeding is now producing excellent grazing once more.

**Tenanted Farms** The type of husbandry practised by the tenant farmers was, until the Second World War, mainly livestock rearing. The emphasis then changed to milk production, and now all but five produce liquid milk for sale. So as to be as self-supporting as possible in feeding-stuffs, most of the farmers have introduced a ley farming system and make lucerne and grass silage. Wheat and barley are the main crops, for the proximity of the nearby steel town of Corby makes it difficult to get the right kind of labour for handling the potato and sugar beet crops.

The farmers who switched over to milk production during the war presented the estate with a problem, since in many instances their buildings were quite unsuited to milk production. The problem has been largely overcome by the introduction of the parlour-type milking system; in some instances new buildings have been erected, and in others satisfactory conversions have been possible. The policy has been for the estate to provide suitable buildings and for the tenants to provide the milking equipment. This has been found to be a good insurance against any sudden decision to adopt a different system of farming, which might the more easily happen if the landlord had borne the cost of the equipment as well as the cost of new buildings, or of the conversion of the old.

Covered cattle yards for feeding cattle have been put up on two of the more outlying farms, and existing yards on several others have been roofed in. Use has been made of a form of feeding passage with folding racks in the centre of the yards, copied from Major Foster's Apley Estate in Shropshire, an example of which was shown at the Shrewsbury Royal Show of 1949.

The concreting of yards and the precincts of farm buildings has been steadily undertaken, and this is done wherever possible by estate labour, working a 7/5 cubic feet concrete mixer, assisted by the farmer's own staff, forming a working party of six to eight men altogether. In some instances this work was done by contract to speed up the improvements, and though contract labour was invariably more expensive, the tendency of costs to increase over the last few years has justified this policy.

Formerly, the land was mostly old pasture and, except for the Weekley and Warkton areas, was not well watered. During very recent years main water

has been brought into the districts not formerly served, and estate-sponsored water schemes have been taken to all farmsteads and to many outlying blocks of land. In addition, 99 per cent of the houses on the estate now have a piped water supply laid on to a sink in each house, and recently modern sanitation has taken the place of the primitive earth closets in 150 houses in three villages. The work of improving others is having immediate attention as sewers become available. Bathrooms, too, are being added as quickly as possible, together with hot water installations. New cooking grates, which also heat the water, are of a type that will burn wood as well as coal—an important consideration on an agricultural and woodland estate.

Many of the farmsteads are centuries old and show interesting examples of the craftsmanship of early days. For example, the entrance to one farmhouse at Little Oakley has a heavy oak door which is locked by a key some 10 inches long and 4 inches deep! The new part of this farmhouse is dated *circa* 1760!

Rents were increased by agreement in 1949, to bring them more into line with post-war values and to maintain a reasonable return on the capital invested in improvements.

**Sporting** No game is reared on the estate, but good shooting is provided by the natural stock of pheasants and partridges. About two-thirds of the sporting is let to a syndicate, and the remainder is in hand. The damage and cost resulting from rabbits and other vermin is recognized, and an Area Clearance Scheme has recently been inaugurated to rid the estate and the surrounding district of the rabbit nuisance. The Land Agent is the Chairman of an enthusiastic Committee, and it is with great interest that we shall watch the results of their endeavours. The estate has six men continually at work destroying vermin, and war on rabbits, hares, grey squirrels and the like is vigorously pursued. Hares as well as rabbits do considerable damage in areas of young woodland, and about 800 grey squirrels, equally harmful to forestry, have been killed annually during recent years.

**In Conclusion** We think the reader will have rightly arrived at the conclusion that this is a well-run and efficiently managed estate. It is not one where money is unimportant and where new funds from extraneous sources may readily be drawn upon if a transfusion is necessary. It is run strictly as an economic undertaking, and each facet of this kaleidoscope of activity is expected to pay its way.

This is helped by a number of contributing factors: the loyalty of the estate employees; the efficient management of each department; the precise system of costings, which immediately lays a finger on an unprofitable branch; the integration of the whole by a competent Agent, and the close interest shown by the Duke of Buccleuch, and by his heir, the Earl of Dalkeith.

Our thanks are due to His Grace and to Mr. Sinnett, his Land Agent, for without their help, co-operation and guidance, this article could not have been written.

# WINTER BEANS IN THE SOUTH-WEST

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**Although the results may not be generally applicable, investigations carried out in the South-West show, that there, mixed crops of beans and cereals give higher and more dependable yields than beans grown alone.**

FARMERS have frequently been disappointed with the bean crop in recent years, and many complaints and requests for investigations to be intensified have been received by the N.A.A.S., especially during and immediately after the war, when feedingstuffs were scarce. Since then, many aspects of the crop have been under examination by private individuals and firms, research stations, universities and the National Agricultural Advisory Service. They include strain, seed rate, plant spacing, time of sowing, manuring, cultivations, seed dressings, spraying, and growing beans in mixtures with other crops. Whatever the result of these investigations, we must face the fact that the cause of disappointment is due not so much to any deterioration of the bean crop, as in its failure to compete with progress made by other farm crops (for example, grass, lucerne, kale and rape) and the improved techniques for their utilization.

Apart from low average yields relative to other crops, another very serious drawback to the bean crop is its violently fluctuating yield from season to season. Given the best known treatment, and in the absence of serious disease, weather alone appears to have a much greater effect on bean yield than on the majority of other farm crops. Combinations of unfavourable season, indifferent husbandry and attacks of pest or disease have often resulted in poor, weedy crops or complete failures; hence the downward trend of the bean acreage in a new era of higher labour costs and machine-aided competitive production.

Different parts of the country have different problems in regard to any one crop. In the South-West the incidence of Chocolate Spot on winter beans is much greater than in, say, the Eastern Counties. Our investigations were therefore planned with this scourge very much in mind. However, despite the fact that epidemics of Chocolate Spot occurred immediately before and immediately after the period of the investigations, when a good many crops had to be ploughed in, the disease was only present in its mild form in our experiments during 1948–52. This must be borne in mind when studying the results. Also, it must not be assumed that the results obtained in the South-West are necessarily applicable in all other parts of the country. The results of extended trials must be awaited.

**Advantages of Bean-Cereal Mixtures** Much of our work was done with mixtures of beans and cereals, partly because of the traditional interest in mixed corn in the West Country, and partly because other aspects of bean growing were known to be under review elsewhere. The basis of this work was to compare the yield and behaviour of various mixtures with the straight crops of beans and cereals grown alongside. The mixtures were based on corresponding proportions of the full seed rates: that is, a half seed rate of beans with a half seed rate of the cereal; three-quarters and one-quarter; and one-quarter and three-quarters. Thus with beans and oats, for example, taking their full seed rates at 3 and 4 bushels, respectively, the half-and-half seeding would be 1½ bushels of beans

with 2 bushels of oats per acre. Most of the experiments were with oats or wheat, but some included winter barley, which can be a useful ingredient in more complex mixtures.

The method of assessing the value of each mixture was to take the yield, analyse the grain, and compare the quantities of protein and starch produced with those from the corresponding areas of the straight crops (thus 2 acres of the half-and-half mixture was compared with 1 acre of beans plus 1 acre of oats). To put the results very briefly, the mixtures yielded on average and fairly consistently a good 20 per cent more of both protein and starch than the corresponding acreages of straight crop. Moreover, compared with the production from the straight bean crops, the mixture containing the lowest proportion of beans yielded on average 87 per cent as much protein, and that containing the highest proportion an equal amount of protein, besides much more starch in each case.

Considerable as these yield increases are, the more important advantage of the mixed crops was found to be their greater constancy of yield. The small farmer, especially, wants to be able to budget as closely as possible for his winter feed requirements, and if he is interested in beans, a mixture with cereals is a far safer proposition. To illustrate this point, whereas only 61 per cent of our straight bean yields fell within plus or minus one-third of the average, over 90 per cent of the yields of the mixtures did so. Had there been epidemics of Chocolate Spot, even bigger advantages might have been expected.

For the reasons already given, it was not possible to get a real measure of the protection against disease afforded to the beans by growing them with a cereal, but there were many instances of Chocolate Spot in its mild form being much more prevalent on the straight bean plots and progressively less on the beans in the mixtures as the proportion of cereal was increased. Whilst it seems improbable that the companion cereal crop would offer prolonged protection in an epidemic year, even a short delay might be of importance at a critical stage of pod development, and at the worst there are the cereals to harvest.

Lastly, the fourth major advantage of sowing bean-cereal mixtures is that they can be grown on a much wider range of soils than one would recommend for pure stands of beans. Beans are usually assocated with heavy land, or at any rate with the heavier loams, but adequately manured bean-cereal mixtures do quite well on some of the lighter soils in the South-West, including some chalky loams in Wiltshire and Dorset.

**Deciding Proportions and Varieties** It would be wrong to dogmatize as to the best proportions of beans and cereal to sow until more trials have been carried out, but the indications are that for small farms in times of protein scarcity a higher proportion of beans than cereal should be sown, but that with broad acres or a free market for feedingstuffs, as now, a higher proportion of cereal than beans is the better proposition.

Some farmers have been under the impression that if they sowed beans and oats in the proportion suitable for milk production, the resultant crop would be nearly enough balanced for that purpose. Actually, on average, the proportion of beans in the harvest crop when grown with oats, is well below that sown; with wheat it is even less. More important still is the great variability in the yield of the beans. In our case, the resultant proportion of beans from a half seeding of beans and a half seeding of oats,

varied between extremes of 79 per cent in a particularly good bean year to 16 per cent in a bad year. The mixture should be carefully sampled as it comes off the thresher and an analysis carried out to ascertain the proportions of the constituents, if not the actual protein content.

The effect of growing beans along with a cereal can be very striking. The growth of the latter is greatly stimulated, straw height being sometimes increased by more than a foot, and the colour intensified. This led us to make careful comparisons between the contrasting types of winter oats, S.147 and S.172. It appeared from this that, even under moderate fertility conditions, so long as there was a half seeding or more of beans, S.172 made the better companion crop.

We had no opportunity of comparing the behaviour of bean strains from different sources, except in the severe winter of 1946–47 before our investigation proper started. However, one of our colleagues, K. M. Pearman, collected seed from a number of sources and grew these side by side in a fairly exposed position. Whilst all plots suffered some frost damage, some strains were definitely more frost-resistant than others.

**Sowing and Manuring** Before we started our experiments, there had been some evidence that late-sown winter beans had escaped disease to a much greater extent than those early-sown. To test this point, sowings of beans were made at short intervals between early October and late February for two successive years at one centre in north Gloucestershire. Chocolate Spot being present in the mild form, it was possible to confirm that the later the sowing the less the disease; but the October sowings gave the best yields, those in December and February being about 30 per cent less and those in November 15 per cent less. The later sowings are also much more vulnerable to the ravages of birds.

Time and time again the importance of potash to the crop was observed, very marked benefits being apparent where a fertilizer distributor, sowing a small amount of potash, had overlapped on the previous run or spilt some on the headlands. Potash deficiency and Chocolate Spot incidence appeared to be closely linked. None of our experiments was designed to ascertain the optimum dressing of potash, but our extensive observations would strongly suggest that the majority of bean crops would benefit from dressings of about 2 cwt. per acre muriate of potash (unless dung has been given).

Ploughing in the beans, whether by broadcasting first or by means of a seed-box attachment on the plough, proved itself a much more satisfactory method than drilling. Bird damage at sowing time and subsequently is undoubtedly one of the most serious obstacles to bean growing on many farms; birds can follow the line of a drill whatever the depth of the seed, but they find a broadcast sowing much more difficult. In our experiments the cereals were drilled immediately after ploughing in the beans, and the two crops matched up satisfactorily for harvesting by binder or combine in most cases. There might, however, be a worthwhile field of investigation in delayed drilling of the cereal for more perfect " combining " conditions in less favourable harvest weather. This practice is occasionally followed in the South-West on some farm crops.

Finally, it must be emphasized that the bean crop is a difficult one to experiment with, and that there may be obstacles to extending trials on anything like the scale of those carried out in the South-West to all other areas. In the meantime, it should be realized that the results we have obtained are not necessarily applicable elsewhere. It does seem, though,

that for the farmer interested in grain as a source of protein, mixed crops of beans and cereals not only offer the prospect of higher average yields, but also much greater dependability. Such advantages cannot be lightly overlooked.

Thanks are due to the farmers in five counties who provided the facilities, and the many colleagues whose work in the field and laboratory contributed largely to obtaining this interesting information.

# A HAMPSHIRE BROILER HOUSE

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A cheap house for twelve-weeks-old table bird production has been designed to provide a weekly output of 1,000 birds.

MANY producers of table poultry in Hampshire are working to a weekly output. This may not agree with some current ideas, but at the moment it is financially successful, and in any case the object of this article is not to debate the pros and cons of the system, but merely to discuss the housing of the birds. If money is no object, it is, of course, easy to devise the perfect house for this type of enterprise. The problem we were faced with in Hampshire was, however, to find a design which would do the job as cheaply as possible consistent with efficiency. The following details of the house that was evolved for an output of 1,000 birds per week may therefore be of interest.

It was recognized that the ideal kind of house was a separate unit per thousand head of poultry, each unit big enough for the chicks to grow without moving or disturbing them. This, however, we could not afford. The design described here aims at giving up to one square foot of space per bird at 12 weeks, with the minimum at one day old. Briefly, under one roof and in one house provision is made for up to 12,000 chicks from day old to 12 weeks, these birds to be housed in separate compartments arranged in four groups of three, each group containing a small floor area (20 feet x 20 feet), a medium one (20 feet x 40 feet) and a large one (20 feet x 50 feet). It is intended that the chicks should spend 4 weeks in the small, a similar time in the medium, and the final 4 weeks in the large compartment. Thus each group of chicks will have two moves in its 12-weeks life. To avoid disturbance, provision is made to walk the chicks from one compartment to the next.

Generally speaking, six main requirements had to be met in the design:

1. The house had to be cheap (the price worked out at approximately £3,500, or in the region of 6s. 6d. per foot super complete, or about 6s. a bird).
2. It had to be easy to erect and suitable for any specific location.
3. Insulation had to be good enough to maintain heat.
4. There had to be efficient control of ventilation.
5. Provision had to be made for light and water.
6. There had to be space for the storage of food, a hot-water boiler and, perhaps at a later date, for processing.

**Details of Construction** The house which we finally designed is 240 feet long by 45 feet wide, with 5 feet to eaves and approximately 14 feet to the ridge. It is a sectional wooden structure on a false wall with chalk floors, and a roof which may be of either corrugated iron lined with 5/16-inch insulation board under purlins (U value* approximately 0.5), or 2-inch straw board covered with stuck-on mineral felting (U value approximately 0.3). The roof trusses are made up from 6-inch x 1-inch timber, supported inside every 20 feet by uprights (which can be made from farm timber). At the sides of the house the trusses lie between sections of the wall and rest on base plates or false walls. A foundation of a base wall of brick or concrete blocks is planned to cover the outer perimeter. This will stand one foot above ground level and will take the rest of the structure.

The walls are made from weatherboarding on a 2-inch × 2-inch framing, and will be lined inside with sheet asbestos after erection (U value approximately 0.5). These walls are in 10 feet sections, 4 feet high. After levelling, the floor is to be of chalk rammed on the site (U value approximately 0.1). Initially, the chalk will be in powder form to keep it dry; it will be rolled and treated after the roof is put on. The interior partitions will be standard 10 feet x 5 feet units. Three main types of partition are used but the framing components are standard in each case, and this has helped to keep the cost down. These frames are solid but are to be hinged in the bottom two feet so that they may be lifted to allow the chicks to pass. The central gangway partitions have the bottom two feet open to take specially designed feeders. These feeders can be removed to facilitate cleaning out.

As I have pointed out earlier, this layout reduces expense, and the standard size partitions permit the interior to be rearranged if so wished. It will be noted that there is no absolute sealing of all compartments. This has been left because of cost. It is hoped, however, to provide standard, movable shuttering, which can be used on every compartment to allow for fumigation.

There is one glass window, measuring 4 feet x 2 feet, to every section of 10 feet (U value approximately 1.0). The top half of each window is of the hopper, drop-inwards type, and also provides the ventilation inlet. Money has been saved by using standard 2 feet x 1 foot cut sheets of glass.

The compartments are so arranged that the youngsters start at the ends of the house and work inwards. This is to tie in with the envisaged processing point in the centre and the fact that it would be expensive to provide roads to each end of the building. It will be seen, however, that this layout could easily be reversed in favourable circumstances to enable the chicks to start at the middle and finish at the end compartments. The final design depends on the site and the position of roads. The central store has a raised roof and provides accommodation for food and the boiler, with space for processing at a later date.

**Ventilation and Heating** Ventilation inlets are provided by the hopper windows, while the outlets are controlled by variable speed fans. This method has been adopted for several reasons. In the first place, nearby trees and grain stores offer obstacles to accurate wind extraction ventilation, and, secondly, so little is known about this subject that it was considered essential to start with a known quantity that could be varied

* The U value is the measurement of the amount of heat transmitted through one square foot of the construction, from the air inside to the air outside in one hour, when the difference between the air temperature inside and outside is one degree Fahrenheit.

in the light of experience. These extractors will enable us to vary the extraction rate according to the age of the chick. It is interesting to note in this connection that while general advice still suggests it is desirable to have eight air changes per hour, if calculations are made based on the $CO_2$ production of the chicks, then just two changes per hour should suffice. Arrangements have accordingly been made to start with two air changes per hour, and it will be interesting to compare the results obtained against the popular "scientific" point of view.

Apart from the saving in cost of appliances, it is obvious that such a reduction in air change makes heat maintenance inside the building much more efficient, and it is hoped that the reasonable degree of insulation achieved will eliminate condensation when the building is maintained at a basic heat of 60°F. It is again emphasized that in this connection we shall know the figure at which we start. It is agreed that had more money been available a better arrangement of fans might have been made.

As regards heating, we are concerned with two main points—space heat and brooding, or top, heat. The intention is to maintain the building overall at 60° F. and to provide the top heat with electricity, using either infra-red or electric heat-radiating appliances. These will be installed in the four small compartments, with provision for occasional heat in the medium-size compartments (it is intended to provide a 15-amp point in each compartment for use with electric cleaners etc., and this should allow of some improvisation if necessary).

In the case of the space heating, the decision to try and keep the building at 60°F. is purely arbitrary, although it is based on work on Hampshire farms over the past year, which has shown, for example, that 70°F. was (a) too hot, (b) difficult and expensive to maintain, and (c) much too dry and dusty unless the humidity could be increased. Other work has shown that 50°F. was too low. There is clear evidence, too, of the value of heat in reducing the amount of food required per pound live weight. It is felt that we might save ½ lb. in food consumption per pound liveweight gain over the 12 weeks by maintaining the temperature as near 60°F. as possible.

Some other points which were taken into consideration in calculating the most suitable space heating were :

1. Allowance had to be made for wind speed and degree of shelter from the wind with regard to ventilation and heat loss. In this instance, with the local shelter and ventilation selected, there was no difficulty.
2. The local temperature (allowing for altitude) had to be taken into consideration. It was found that the lowest average night temperatures occurred in December, January and February, and were about 40°F. Also considered were the daily and monthly variations from this average and the number of nights per month when the temperature fell below freezing point.

After much discussion it was decided to provide for the maintenance of a temperature of 60°F. when the outside temperature fell to 30°F. Time will show whether, in fact, this decision was sound.

We also considered the heat loss through the walls, roof, windows and floor of the building. Allowing for a maximum drop in temperature of 30°F., the greatest loss was found to be approximately 7 million B.Th.U.s in twenty-four hours. The heat produced by the chicks themselves can be calculated at some 3 million B.Th.U.s in twenty-four hours. The difference gives us a heat loss of approximately 167,000 B.Th.U.s per hour. To provide against this, we are using a coke-fired boiler with a single circuit of 4-inch pipe which runs around the entire house at just about the level of the false wall and which, it is hoped, will heat at least some of the air coming in

through the windows. The boiler provided can carry a high overload for occasional use in very cold spells.

A further advantage in the separate provision of space and top heat is that in very hot weather it is probable that the space heating can be discontinued, thus saving fuel and labour, as well as keeping down the temperature of the building. The advantages of oil-fired boilers and automatic stokers were discussed, but the capital outlay for these could not be met. It should be noted that a considerable saving can be made here by the use of secondhand piping.

**Feeding and Watering** Feeding troughs will be built into corridor partitions, and supplemented by small troughs for the small compartments. Electric light will be provided over these central troughs, but is is probable that more will be necessary. At a later stage experiments will be made with a simple form of automatic feeder. For guidance, it is felt that the provision should be one 4-feet, double-sided trough per 100 chicks up to six weeks, the allowance to be doubled thereafter.

The watering system is based on constant-flow troughs running from the gangway to the side of the house. Water from a tap on the standpipe drops into the open trough and flows out at a right-angled drain inside the house. The trough is movable and rests on brackets screwed on to the partition. It is maintained at a constant height (approximately 10–12 inches) and a wire ramp is provided for the chicks to run up. In practice, this is found to be better than adjusting the height of the trough, and the chicks use it well from one week old. This arrangement also permits medication of the water.

**A Cheap Unit** The building is an attempt to provide a cheap unit to meet an output of 1,000 twelve-week-old table birds per week. Obviously it has disadvantages, but it appears to be the best compromise possible at the present time. One major disadvantage will be the danger of disease, but it is hoped to avoid trouble by "resting" and fumigation. The building itself can be used as two major units, four smaller units, or twelve minor, or "weekly", units, and can easily be rearranged internally to fit in with experience or other requirements.

Thanks are due to Messrs. Andover Timber Co. and the Thames Bank Iron Works who have co-operated in the design.

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**British Weed Control Conference, 1954**

The British Weed Control Conference 1954, organized by the British Weed Control Council, will be held on November 2, 3 and 4 at the Majestic Hotel, Harrogate. The Conference will be residential, although registration with or without accommodation may be made. The registration fee is £2. 10s. and entitles members to attend the meetings of the Conference and to receive a copy of the Conference Proceedings.

Provisional programmes and application forms may be obtained from the Conference Treasurer, Mr. W. A. Williams, Association of British Insecticide Manufacturers, Cecil Chambers, 86 Strand, London, W.C.2.

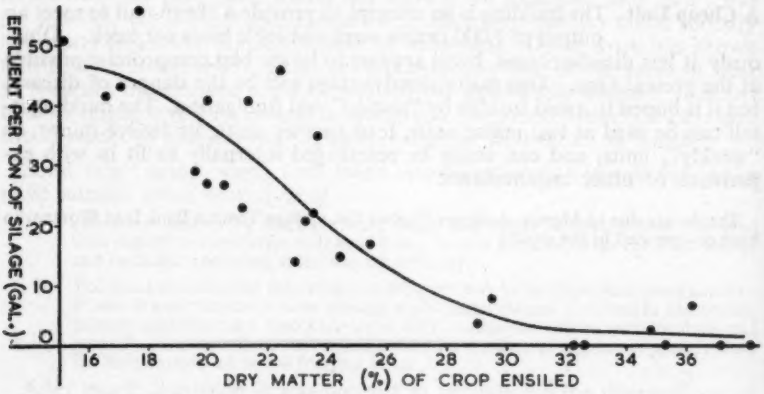
# SEEPAGE FROM SILOS

J. C. MURDOCH, B.Sc. (Agr.), Ph.D.
*National Institute for Research in Dairying, Shinfield, Reading*

**Seepage from silos means loss of nutrients and probably also blocked drains. It can be lessened by making a higher dry matter silage and protecting it against rain.**

EFFLUENT from silage is normally objectionable because of its unpleasant smell and the fact that it attracts flies. But there are other objections. One is the loss of nutrients, which can be considerable if the grass ensiled is very wet. In experiments at Shinfield we have had losses of up to 8 per cent of the dry matter filled into the silo. The main part of this lost dry matter is made up of protein and minerals, and reductions of the order of 10 per cent of the crude protein put into the silo are not uncommon.

The dry matter content of the ensiled grass has a marked effect on the seepage and, as can be expected, the amount of liquid draining from the silo falls quickly as the dry matter content of the grass increases. Seepage from silos has been measured in our experiments for three years, and the results are shown in the graph. It will be seen that seepage was lessened considerably when the dry matter content of the grass was approximately 25 per cent, and almost eliminated when it was increased to 30 per cent.




**Relationship of dry matter content of crop to the amount of seepage from the silo.**

Another reason for paying attention to the effluent from silage is that if the drain from the silo is led into field drains, there is a possibility of extensive mould growth which may, in the end, completely block the field drain. This is due to the fact that seepage, suitably diluted by water in the field drain, forms a good growth medium for the fungus, and normally enough air is present in the drain to encourage growth. Blockage of drains in this way has been reported in various parts of the country, and on one of the Institute farms a drain some twelve inches in diameter was rendered useless by fungus growth. The expense of clearing or replacing a drain

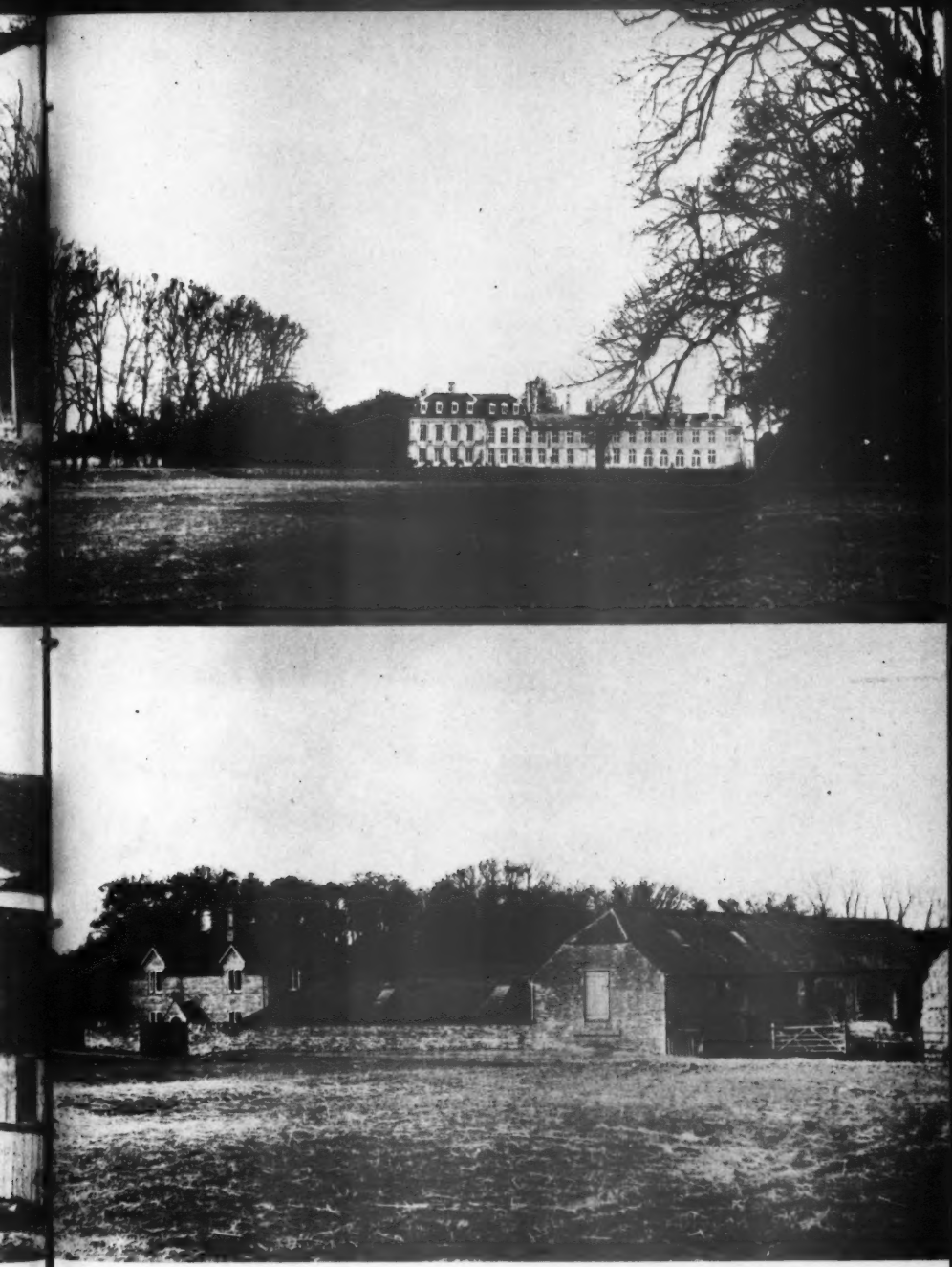
Recording output—the value of the stitch in time.

An article on Economy in the Feeding of Concentrates appears on p. 226

THE BOUGHTON ESTATE

*Top*: The Woodlands—selective thinning and wide rides.

*Bottom*: The Estate Sawmill, well sited on sloping ground.



**ON! ATE** (Article on pp. 211–6)

*Top*: The Mansion seen from the west avenue.

*Bottom*: The Home Farm, sheltered and easy of access.

**HIGHER YIELDS FROM HEALTHIER STOCKS** (Article on pp. 232–6)

*Top*: Potato indentification.
*Bottom*: A crop of certified "Special Stock" Majestic.

*Top*: A crop from "Twice-grown" Majestic. (Note uneveness of plant growth.)
*Bottom*: A degenerate or virus-infected stock of Majestic.

blocked by this mould is considerable; it demonstrates very forcibly the importance of disposing of such seepage.

Lastly, the Department of Scientific and Industrial Research has shown that seepage from silos is highly polluting, and that such effluent discharged directly into a watercourse may cause a considerable amount of fouling. Results show that the seepage from a ton of silage of 17.8 per cent dry matter is equivalent to some 12,000 gallons of settled sewage. This figure may be excessive, as the analysis of the effluent was made on seepage from tower silos which were protected from the weather. With the normal methods of making silage in this country, in pits or in clamps, various factors are involved which are not present with the roofed tower silo. Probably the main one is that in a pit silo a considerable amount of the seepage will make its way into the surrounding soil through the sides and bottom of the pit, and the quantity reaching the drain of the silo will thus be less. Normally, with the clamp silo, which is on the surface of the ground, no form of drainage is provided and the seepage will soak into the ground. When these two points are considered it seems unlikely that the amount of seepage reaching a watercourse will be as high as that quoted for the tower silos. On the other hand, a lot of rainwater does penetrate into a silo, unless it is carefully covered or roofed, and this will increase the total amount of seepage.

**The Solution** Various methods of disposing of seepage have been tried. Among these was the pumping of the effluent back on to the silage to prevent the loss of nutrients, but it was found to have a deleterious effect on the quality of the silage. Using the effluent as an animal food is a possibility, but the main difficulty is that the flow is very seasonal. A reasonable volume is available for no more than 4–5 weeks after ensiling, and it is doubtful whether the cost of collection would be justified. The seepage can, of course, be spread on the land as a liquid manure, but, again, any entensive disposal in this way is unlikely to be economic, to say nothing of the risk of blocking the field drains with fungus.

As has been pointed out, the volume of seepage can be reduced or completely eliminated by raising the dry matter content of the herbage to be ensiled. In reasonably good weather, wilting for 6–12 hours during the day will decrease the moisture content of the grass sufficiently to reduce subsequent seepage from the silo to negligible amounts. There are the added advantages that wilted herbage is easier to make into silage and that less bulk has to be carted to the silo. However, care must be taken not to overdo the wilting process, otherwise there will be difficulty in consolidating the mass, giving rise to overheated or, in extreme cases, mouldy silage. Overheated silage, which is brown and sweet smelling, will be palatable to stock and, in general, well preserved, but the value of the protein to the animal will be much less. As a rough guide, the grass will have wilted sufficiently when leaves begin to wither and curl, but with a heavy cut of grass it is advisable to turn it before carting so that the undersurface of the swath has a chance to wilt.

*Top*: A crop from "Twice-grown" Majestic. (Note uneveness of plant growth.)
*Bottom*: A degenerate or virus-infected stock of Majestic.

*Top*: Potato indentification.
*Bottom*: A crop of certified "Special Stock" Majestic.

# ECONOMY IN THE FEEDING OF CONCENTRATES

D. B. WALLACE, M.A.
*School of Agriculture, University of Cambridge*

Feeding efficiency and low costs go hand in hand. Stock farmers will be well repaid by a critical examination of their enterprises to make sure that they are getting the maximum return for concentrates fed.

IT may well seem a little strange that an article urging economy in the feeding of concentrates to livestock should be written at a time when the supply of such feedingstuffs is increasing and the prices falling. But there is a strong desire on the part of both the Government and of farmers to reduce costs of home agricultural produce in order to make it more competitive with imported food. Indeed, the last Price Review laid especial emphasis on this aspect.

In livestock production, feedingstuffs are usually the largest single item, and in many cases concentrates form the major part of these feeding costs. The figures below, taken from enterprise cost studies carried out by the Farm Economics Branch of the Cambridge School of Agriculture, show very clearly just how high a percentage of total costs is represented by concentrates for three types of livestock.

| | *Percentage of Total Costs* |
|---|---|
| Pigs .. .. .. .. .. | 80 |
| Laying poultry .. .. .. | 65 |
| Dairy cattle: | |
| Concentrates only .. .. | 36 |
| All food .. .. .. .. | 58 |

These figures are, of course, averages, and wide variations occur not only between individuals but also between various systems for each type of livestock. Nevertheless, they show that it is in the sector of feedingstuffs, particularly concentrates, that the greatest saving can be effected. But first of all it is necessary to prove that there is, in fact, scope for such economies.

**Scope for Saving** In the case of pigs, the last full year's results of the Cambridge Food Recording Scheme for Pigs show that the cost of food, per £100 of gross output, varied from £49 to £98. This means that for every £100 of pigs produced, or say five baconers, the first farmer used £49 worth of food, while the second farmer used £98 worth—twice as much. In the latter instance this leaves only £2 to pay for labour and miscellaneous costs and to provide a profit—clearly an impossibility. The same point can be demonstrated from the conversion factor in fattening bacon pigs; that is, the quantity of meal required on average to make 1 lb. liveweight increase. In the same sample this varied from 3.3 to 6.3 lb. Here, the least efficient farmer would have saved 9d. on his feed costs for every pound of live weight produced if he could have achieved the level of the more efficient farmer. This saving would amount to £6 15s. for each "standard baconer" produced at 8 score dead weight.

In egg production, the cost of feedingstuffs is not quite as large a proportion of total costs, but it is still by far the most important. In 1952-53 the cost of food for birds in henyards varied from £46 to £66 per £100 gross output, according to the Cambridge Food Recording Scheme for Poultry. This

represents a difference of £20 for every forty hens, or about 10s. per bird. Such a difference was more than enough to swallow up all possible profit for the least efficient producers. In physical terms, the quantity of meal per dozen eggs varied from 6.6 to 8.9 lb.—a difference of over 8d. per dozen. A similar result was observed in the rearing of pullets from day-old chicks to point of lay. The quantity of food varied from 22 to 43 cwt.—a difference of £36 15s. per 100 birds.

The case of dairy cows is not nearly so simple and, in fact no ranges that would mean very much can be quoted, for two reasons. First, as has been shown in a previous article in this JOURNAL,* more concentrates per gallon are required for high-yielding cows. Secondly, there are many different systems of keeping dairy cows, ranging from the extensive use of grass products to the intensive feeding of concentrates while virtually ignoring grassland. In consequence, general figures mean very little and it would be necessary to quote ranges of efficiency for each sub-division. This would immediately lead on to the question of the merits of different systems and the relative costs and returns to be expected from them. As a result, the discussion could not be restricted to the wasteful use of concentrates, but would also have to go into the question of whether such concentrates were justified at all.

**Value of Food Recording** Having shown that farmers apparently practising the same system of livestock husbandry use widely different quantities of concentrates to get the same product, it is important for the farmer who depends on livestock for any sizable part of his income to have a reliable measure of feeding efficiency. It is only possible to obtain this with accuracy by some method of food recording. To many this will suggest copious records involving a large amount of work and time. But this is entirely wrong, for the only *essential* information required is the quantity of concentrates fed to the different types of livestock, for example to breeding pigs, fattening pigs and laying hens, and the production achieved during the same period. These records *can* be kept on odd bits of paper or barn-cards, but as likely as not they will be mislaid or not be available just when required. Any farmer who is seriously testing his feeding efficiency would be well advised to use one of the many record books produced for this purpose. They are not expensive and require little time for upkeep. For those who have an aversion to "paper farming" it must be pointed out that a little time spent in establishing records of feeding means that effective control is being maintained over the biggest single item of cost in the production of pigs and poultry, and also in most systems of milk production. And the value of the stitch in time is well known.

If such food recording is embarked upon and the results show a low level of efficiency, the farmer must beware of the simple expedient of a *direct* cut in feedingstuffs without further thought and investigation. It may be that more food is being fed than can be converted by the animals concerned, and that some is going to waste. But it is more likely that the bulk of what is being fed is being utilized in some way, though not necessarily for production. In the former case, a direct cut of the amount being wasted should not affect production at all, and there will be an increase in profits equal to the reduction in costs. In the latter case, however, such a cut might reduce production by *more* than the value of the feedingstuffs saved. A recent example known to the writer illustrates this quite clearly. A farmer became alarmed at the size of the feedingstuffs bills for his dairy cows and decided

* Does it pay to Feed Concentrates to Dairy Cows? M. B. JAWETZ, **60**, 56–61.

to cut the amount fed by 10 cwt. per month. His milk production dropped by 250 gallons over the month, so that a lowering of his costs by about £18 reduced his revenue by £30.

**Causes of Poor Feeding Efficiency** Where there is no actual waste of food, the causes of poor feeding efficiency are many and varied. The farmer may have poor-quality stock that is incapable of converting feedingstuffs efficiently into production, he may be using the wrong type of food to get the best results, or he may be feeding it in such a condition as to reduce its palatability. On the other hand, it may be due to the environment in which the livestock are kept. Thus if fattening pigs are kept in draughty buildings, much of the food fed goes to provide body heat rather than to the production of meat. In such circumstances, it is almost certainly cheaper to improve the living conditions by simple insulation, such as straw bales, rather than to use meal as a form of "central heating".

Better livestock management can often increase the value of production by far more than any extra cost that may be incurred by so doing. This is particularly true with laying hens, where the use of artificial lighting will normally increase the egg yield without need for recourse to extra feedingstuffs.

It may require a long period of careful investigation, with many small changes in the environment and methods used, before the true causes of low efficiency are located, and it will often speed up the inquiry and pay the farmer if he seeks technical assistance from outside in this problem.

To sum up, the accent in the future will tend towards reducing the costs of agricultural production. In livestock husbandry feedingstuffs form the major item in the costs, and for many types of livestock and systems of management the bulk of the feedingstuffs used are in the form of concentrates.

There is evidence of a great range in the quantity of these concentrates used by different farmers, and it behoves each one to discover whereabouts in this range his own enterprises lie. If he finds that his level of feeding efficiency is low, then he should seek the cause and endeavour to remedy it, not only for the effect it will have on his own pocket, but also in the national interest, since it cannot be good for only four animals to be produced on the foods that can produce five. Since feedingstuffs are so big a factor in livestock production, the old adage of "Waste not, want not" might well be taken as a personal motto by every stock farmer.

# "TULIP ROOT" OF OATS IN DURHAM

K. McLEOD, B.Sc., W. H. GOLIGHTLY, B.Sc., Ph.D., and C. D. PRICE, M.Sc.
*National Agricultural Advisory Service, Northern Province*

Stem and Bulb eelworm, or "tulip root", is a serious problem on the farms of East Durham, where oats are a very important cash crop. If rotational control is impracticable, the growing of a resistant variety such as Milford seems to offer the best solution.

THE eastern part of Durham County is predominantly arable, with an emphasis on cash cropping to cater for the large industrial centres on Tyneside, Wearside and Tees-side. There is a steady demand for milk, potatoes and cereals, and although dairy cattle are kept on most farms, there is normally a high proportion of arable land. In some cases, possibly due to colliery subsidence or soil type, the whole of the farm does not lend itself to arable cropping. The heavier, wetter fields are usually permanent grass, the remainder often permanent arable. Certain areas of a farm, too, may not be suitable for sowing down to long leys because of the lack of fencing or water, while trespassing (a serious matter in industrial districts) reduces the effective use of many fields for grazing. It is understandable, therefore, that these peculiar circumstances, combined with the demand for cash crops, make it difficult for many farmers in the eastern part of the county to adopt sound rotations. Consequently, some troubles associated with overcropping have developed on several farms in the area.

One of the greatest problems, and one which has occupied the attention of the N.A.A.S. for the last three or four years, is Stem and Bulb eelworm of oats. The oat crop, whether grown for home consumption or for sale to local merchants, has for many years been of such importance that serious overcropping has occurred. This frequent cropping with oats has contributed to the development of eelworm to a stage at which heavy losses occur. Since winter oats are not popular, the spring varieties are grown as part of the rotation in conjunction with potatoes, wheat, and short leys, the latter usually being of only one year's duration. Though the pest is by no means confined to the smaller farms, it is here that it is most difficult to avoid the circumstances which lead to its development. Often heavily stocked, such farms must frequently use the limited arable acreage to produce oats.

Failures due to eelworm are found on quite dissimilar land, ranging from free-working loam overlying Magnesian Limestone to strong clay. It would seem also that the level of fertility is not a decisive factor, although symptoms are apparent earlier in a crop grown under conditions of low fertility.

Many farmers in East Durham will now be familiar with the condition known as "tulip root", or "segging", which arises from eelworm attack. The damage appears characteristically in patches which spread quickly in extent and number with frequent oat cropping. The eelworms gain entry to the stem of the young oat plant, multiply, and eventually produce a swelling of the basal portion of the stem – hence the name "tulip root". In addition, the plant, in its efforts to survive, may produce an excessive number of short and twisted tillers which contribute nothing to the yield of the crop. When the infestation becomes heavy, growth ceases, the plant rots about ground level and finally it dies. Upon the death of the plant, the eelworms become quiescent, and they will remain in this condition until they die or until another susceptible crop is grown. In the absence of a host plant, it is possible for the eelworms to survive in a dormant state for several years.

Of the cultivated cereals in this country, only the oat is susceptible, but this eelworm will also attack beans, mangolds and sugar beet. There is no record of sugar beet or mangolds having been attacked in Durham, although eelworms have been recovered from sickly field bean plants. In addition to these cultivated plants, a number of weeds of arable land, including cleavers, chickweed, fat-hen and redshank, may act as hosts. Chickweed, in particular, is very common in Co. Durham, and many eelworms have been found in samples from infested fields. Though the earlier records were mainly from the eastern half of the county, the pest now appears to be established in the south, extending westwards for a considerable distance along the north bank of the Tees.

**One-tenth of E. Durham Fields badly Infested** The heaviest infestations are associated with the coal-mining areas, where oats have long been grown as fodder for pit ponies—a practice which undoubtedly led to overcropping. In these conditions, small initial infestations spread rapidly. Records from one badly infested farm show seven oat crops in fourteen years in one field, and while this is exceptional, in many cases oats have appeared in the rotation far more frequently than was consistent with good practice.

To assess the distribution and degree of attack by the Stem and Bulb eelworm, a survey was undertaken in 1951 in East Durham. A total of thirty-seven farms, selected at random, were visited, and on these 116 oat crops, involving some 900 acres, were inspected. Observations were made on the incidence of Stem eelworm, and cropping records for at least the previous four years were obtained. On a farm basis twenty-two (82 per cent) of the thirty-seven farms gave positive symptoms and, on an acreage basis, some 30 per cent of the area inspected proved to be infested. To assess the degree of infestation, a visual scoring method was used, the fields being marked from 0–5 according to whether they were uninfested or very badly attacked. On this basis, twelve fields (that is, 32 per cent of the total infested fields and roughly 10 per cent of the total number of fields in the survey) rated between 3 and 5.

Cropping records revealed that more than 36 per cent of the fields examined had grown two oat crops in the previous four years, and on 5 per cent of the fields three oat crops have been grown during this period. Nearly 14 per cent of the fields had grown two consecutive oat crops, and 2½ per cent had had three such crops. In addition, beans and mangolds, which are alternative host crops, had appeared during this period in some of the fields surveyed.

**Milford—a Resistant Variety** A possible answer to the problem of controlling "tulip root" came to light in 1951, when a fully replicated spring oat variety trial, conducted jointly by the National Agricultural Advisory Service and the National Institute of Agricultural Botany, was laid down inadvertently on a field which proved to be heavily infested with eelworm. In early July it became clear that all the varieties except Milford were seriously affected. The harvested weights of the different varieties are given in the table opposite, together with the percentages of plants which were visibly attacked.

In addition to the details given in the table, a considerable amount of supporting evidence of the value of Milford as a resistant variety has been collected from other farms in the county. As a result of this trial, a number of farmers in one district specifically ordered Milford for the 1952 season for sowing on fields known to be infested. Satisfactory yields were obtained,

except in one instance where New Minor was supplied in error ; this variety was heavily attacked and produced less than one-third of a normal crop. On another farm in a different district, 10 acres of Milford and 10 acres of Onward were sown on a 20-acre field which had a history of partial oat failures due to eelworm. The fertility level of this particular field, and indeed of the whole farm, is very high, but the Onward was seriously damaged by eelworm and had to be ploughed out in the early summer, while the Milford produced a yield of 30 cwt. per acre.

**Yield of Five Varieties of Oats on Land Infested with Stem and Bulb Eelworm (1951 Harvest)**

| Variety | Yield at 15 per cent Moisture (Average of six plots for each variety) | Percentage of Plants Visibly Attacked by Eelworm |
|---|---|---|
| | *cwt. per acre* | |
| Milford .. .. | 24.80 | 0 |
| Opus .. .. | 14.07 | 51.2 |
| Eagle .. .. | 13.39 | 57.8 |
| Sun II .. .. | 10.00 | 71.3 |
| S.221 .. .. | 7.16 | 66.4 |

A survey of cereal varieties covering the 1953 harvest shows that about 1,000 acres of Milford were grown in Co. Durham. In ordinary circumstances, this variety requires conditions of fertility which are well above average if it is to produce yields which are comparable, say, with Sun II, but on eelworm-infested land a lower, though regular, yield of Milford may be preferable to the partial failure and, therefore, uncertain yield of some other variety.

As far as is known, Milford is the only spring variety which is resistant to Stem and Bulb eelworm, but several winter varieties have a valuable degree of resistance, and though there is little general interest in winter oats in Durham at present, some farmers regularly grow a small acreage. Thus S.172 is already grown to a limited extent in Durham but, like Milford, it requires a high level of fertility. It is possible that S.81 may have a particular value on much of the infested land, as it is more suited to conditions of moderate fertility than is S.172. Unfortunately, seed of S.81 is difficult to obtain, although it could be multiplied quickly if any considerable demand arose for it. The older varieties, Grey Winter and Unique, may be used if necessary in the absence of S.81. The well-known winter oat, S.147, which is widely grown in many parts of the country, is highly susceptible to Stem and Bulb eelworm and should not be used on infested fields. Cultural treatment, where practicable, can do much to eliminate the pest. The spraying of all cereal crops in the rotation with weed-killer will eradicate many of the host weeds which harbour the eelworm, and wheat and barley can be successfully grown on infested fields, which, as a last resort, could also be put down to grass. A period in ley offers a way of utilizing infested land, but the possibility of eelworm attack should the ploughed-out ley be sown to oats may still exist to a degree at present unknown.

# HIGHER YIELDS FROM HEALTHIER STOCKS

A. P. WINSOR, B.Sc., A.R.C.S. (IRELAND)
*National Agricultural Advisory Service*

Pests and diseases cause food losses we can ill afford. Mr. Winsor here discussess some of the certification schemes that have been introduced since 1918 in an effort to provide the grower with pure and healthy stocks.

THE aim of getting more food from fewer acres may, as far as the arable side is concerned, be achieved in several ways, each contributing its quota to the whole. One approach is by growing the heavier yielding varieties. Here, the work of the plant breeder is all-important, since heavier cropping must not be obtained at the expense of quality. Attention is also being directed nowadays to the raising of plants having a marked degree of resistance to a specific pest or disease. Examples of these are varieties of strawberries resistant to Red Core (*Phytophthora fragariae*), varieties of potato immune to Wart Disease (*Synchytrium endobioticum*), and fruit tree rootstocks resistant to the Woolly aphid (*Eriosoma lanigerum*). A second method is by intensive ley farming. And, finally, there is the battle to counteract pests and diseases, particularly the virus diseases. It is with this latter aspect that I wish to deal.

Apart from control during normal cultural operations, our crops of economic importance may be protected from pest or disease in any one or all of the following ways:

1. By imposing regulations requiring all imported planting material to be accompanied by a certificate issued by the appropriate authority in the exporting country certifying that the material is healthy (that is, free from dangerous pests or diseases).

2. By the introduction of domestic regulations making it compulsory to comply with certain conditions, such as the notification of an outbreak of a certain disease (Red Core Disease of Strawberry Plants Order), or by making it an offence to sell diseased plants (Sale of Diseased Plants Orders), and so on.

3. By the introduction of crop (health) certification schemes.

Any action taken under (1) does not necessarily prevent a pest or disease from getting into the country, but there is very good reason to believe that such a regulation assists materially in *delaying* the entry of a harmful pest or disease or reduces considerably the risk of its introduction. Under (2) a serious pest or disease may be kept under control and its rate of spread very greatly reduced. The third method mentioned is of more recent application and at present affects only a limited range of plants. There are possibilities of extension, but this depends very largely on the maintenance of trained staff to perform the inspectorial work during a limited period of the year, because the inspections can be made only during the growing season of the plants.

**Propagation from Healthy Stock** It is most fortunate that a large proportion of the crops we grow for food are propagated from seed. Very few virus diseases are transmitted in the seed, and thus many crops can be grown to maturity without viruses assuming any economic importance. There are exceptions; some crops, such as lettuce, raised in seedbeds and having as few as 2 or 3 per cent virus-infected seedlings, may give rise to a heavily infected crop before reaching maturity, causing

a loss of 80–90 per cent of the marketable produce. The rapid build-up of virus infection in such instances is caused by aphids feeding on the crop and transmitting the virus from infected plants to healthy ones. Such an insect is generally known as a "vector". To overcome losses caused in this manner, measures should be taken to remove the vector or reduce its numbers to extremely small proportions at an early stage of the crop's development.

The position is rather different when we have to deal with crops that are propagated vegetatively. Most of our soft fruits fall into this category, as also does the potato. One feature of a virus disease is that it is to be found in all parts of an infected plant, except the seed, and any portion from such a plant used for propagation purposes will perpetuate the disease. This factor makes it imperative that propagation should start from a healthy parent or stock.

It might be suggested that the fruit and hop-growing sections of the industry should organize its own schemes to overcome such a serious problem, particularly in connection with those commodities which are of national economic importance, but many obstacles have arisen to make this impracticable until the present time. Recently, however, a Nuclear Stock Association has been formed under the aegis of the National Farmers' Union, which will undertake to receive virus-free clones from our research stations and propagate them to the stage at which they may be included in the certification schemes, thus making them available to growers interested in propagation or fruit production. The Association is beginning its work with strawberries, and there appears to be no reason why other commodities should not be included later on.

To help the industry and to make available to the farmer and grower planting material of a known standard in regard to health and purity, the Ministry of Agriculture has from time to time instituted certification schemes, which now cover such crops as potatoes, strawberries, black currants, raspberries, fruit trees rootstocks and hops. A brief historical description of some of these schemes, in the order in which they were introduced, may be of interest.

**Potatoes** The potato scheme began in 1918 as a direct result of the Wart Disease of Potatoes Order, a requirement of which was that only immune varieties should be planted in infected land. To implement this, provision of stocks true to type was essential, and accordingly a small staff was trained to recognize commercial varieties of potato. Crops were then inspected during the growing season and, if of a high degree of purity, were certified as true to variety. In 1940 the scheme was extended to include the health (that is, freedom from virus and fungus diseases) of the crops entered for certification, and from time to time modifications have been made to the scheme in the light of experience, to maintain a high standard in conjunction with good cultural practice.

There are now three grades of potato certificates. The "S.S." (Special Stock) is awarded to crops attaining the highest standard of health and culture. To qualify for this, there must be no more than four virus-infected plants per acre at the second inspection, and purity (trueness to type) of a variety must be practically 100 per cent (actually 99.95). The next grade of certificate ("A") is awarded to crops attaining a purity of not less than 99.5 per cent and having not more than 0.5 per cent of plants severely infected by virus. Finally, the "H" certificate is awarded to those crops which attain a standard of 99.5 per cent purity and, at time of inspection, do not contain more than 2 per cent severely-infected plants per acre.

## HIGHER YIELDS FROM HEALTHIER STOCKS

Growers interested in seed potato production should invariably use "S.S." certificated seed. If, however, the area is particularly suited to the production of high-class seed, very good results may be obtained from seed derived from stocks carrying an "A" certificate. It is generally recognized that under normal conditions of culture excellent crops of *ware* potatoes can be produced from both "A" and "H" certificated seed, but the latter should be regarded, at best, as suitable for the production of good crops of ware potatoes under normal conditions of cultivation.

Work has been undertaken to show that yields can be greatly reduced by the presence of virus infection in the crop, according to the severity and type of virus. Some examples are:

| | *Loss per cent* |
|---|---|
| Very mild Mosaic .. .. | up to 5 |
| Mild Mosaic .. .. .. | 5 – 40 |
| Severe Mosaic .. .. .. | 40 – 60 |
| Leaf Roll .. .. .. | 40 – 80 |

Losses in production of this order make it essential that farmers and growers should have seed of known performance available for planting, and this is precisely what the scheme is intended to provide. Special areas suitable for high-class seed production have been found, but even so, constant attention to roguing is essential if a high standard of health is to be maintained.

The terms "once grown" and "twice grown" are familiar to all who grow potatoes. But in most parts of England the longer crops are grown under normal conditions from the same parent stock, the greater becomes the incidence of severe virus diseases, because of the manner in which these viruses are transmitted from plant to plant. This is readily apparent not only from the rapid decline in tuber production but also in the development of the haulm, as may be seen in the illustrations on p. IV of the art inset.

**Strawberries** Certification of strawberry plants began in 1927, the scheme having been brought about largely by the fact that the fruiting yields had been falling over a number of years, that planting material was being found unreliable, and that degeneracy in stocks was becoming widespread. Hopes were held that the provision of reasonably healthy plants under such a scheme might help the industry to attain normal yields of fruit again; and, in fact, this has been achieved.

The scheme has been modified from time to time to suit conditions and progress in our knowledge of diseases, etc. Research has shown that the degeneracy of stocks is caused by virus diseases, two of which are known to growers as "Yellow Edge" and "Crinkle". They are recognizable by the symptoms produced in the foliage and general dwarfing effect, combined with lack of fruiting. All growers will know how prone the strawberry is to attack by fungus diseases and insect pests. Fortunately, our plant breeders are giving much attention to the breeding of disease-resistant varieties, and with the help of these new varieties and the certification scheme our crop yields are surpassing former levels of production. In fact, the crop output today in respect of *all* soft fruit exceeds that of fifteen years ago, in spite of a much smaller acreage, as the average figures clearly show.

| Years | Acres | Yield per Acre | Total Production |
|---|---|---|---|
| | | *tons* | *tons* |
| 1934–39 .. | 52,200 | 1.03 | 53,700 |
| 1947–51 .. | 44,500 | 1.52 | 67,500 |

## HIGHER YIELDS FROM HEALTHIER STOCKS

**Acreages and total production naturally vary a little from year to year, but the trend over the past 17 years for the three fruits discussed here is obvious in the following table:**

| Year | Strawberries | | | Raspberries | | | Black Currants | | |
|---|---|---|---|---|---|---|---|---|---|
| | Area | Yield | Total Production | Area | Yield | Total Production | Area | Yield | Total Production |
| | *acres* | *cwt.* | '000 *tons* | *acres* | *cwt.* | '000 *tons* | *acres* | *cwt.* | '000 *tons* |
| 1936–37 | 24,635 | 15.0 | 18.4 | 5,780 | 15.1 | 4.4 | 9,772 | 14.0 | 6.8 |
| 1937–38 | 21,242 | 27.0 | 28.7 | 5,401 | 29.2 | 7.9 | 9,981 | 20.7 | 10.3 |
| 1938–39 | 20,583 | 17.2 | 17.7 | 4,663 | 13.6 | 3.2 | 10,038 | 12.5 | 6.3 |
| 1946–47 | 12,332 | 29.2 | 18.0 | 2,075 | 12.4 | 1.3 | 9,145 | 20.4 | 9.3 |
| 1947–48 | 13,044 | 32.6 | 21.2 | 2,361 | 21.4 | 2.5 | 11,282 | 27.6 | 15.6 |
| 1948–49 | 16,078 | 32.8 | 26.4 | 2,767 | 21.4 | 3.0 | 12,415 | 21.8 | 13.5 |
| 1949–50 | 20,125 | 40.1 | 40.4 | 3,781 | 19.0 | 3.6 | 15,271 | 17.9 | 13.7 |
| 1950–51 | 21,055 | 27.8 | 29.3 | 4,330 | 24.1 | 5.2 | 16,026 | 20.4 | 16.3 |
| 1951–52 | 17,527 | 38.8 | 34.0 | 4,348 | 33.8 | 7.4 | 15,911 | 30.0 | 23.9 |
| 1952–53 | 15,994 | 24.4 | 27.5 | 4,269 | 33.9 | 7.2 | 14,959 | 35.4 | 26.5 |

**Black Currants and Raspberries** Many years ago it was observed that some black currant bushes lost their fruiting capacity, even though the season might have been generally favourable. The berries dropped from the strigs and the latter remained attached to the branches in a dried-up condition. Accompanying this symptom was another in which the leaves became abnormal in shape and the number of main veins was reduced. The general appearance of the diseased bushes was such as to warrant the name "Reversion". More recently this disease has been found to be a virus, which the Big Bud mite can transmit from infected to healthy bushes.

To help fruit growers buy bushes reasonably healthy and free from "Reversion", a certification scheme was introduced in 1928. The bushes eligible for inspection and certification are those in fruiting plantations which have not been planted out longer than five years, and those in nursery rows (with the exception of "maidens"). The inspection scheme takes into account insect pests, such as Leaf Curling midge, eelworm, etc., and a high standard of health is required in addition to trueness to variety or type.

The Raspberry scheme is of more recent introduction (1944) and, like those already mentioned, has proved of great value to growers by making available healthy stocks of planting material. It is applicable to cane nurseries only (fruiting plantations are excluded) and there are two grades of certificate available – the "Ordinary" and the "S.S." (Special Stock). Naturally, the conditions governing the latter are more exacting.

The raspberry is also liable to attack by viruses, and plantations can, in the course of a few years, become so greatly reduced in vigour and cropping capacity as to be completely uneconomic. Readers will readily remember how our stocks of the variety Lloyd George degenerated until not a healthy

one existed in the country. Fortunately, a "clean" stock was found in New Zealand, and this has provided us with a new source from which to propagate our present-day certified stocks of the variety. Other pests and diseases are taken into consideration by the Ministry's officers when making their inspections and recommendations.

**Fruit Tree Rootstocks** Research has shown what a tremendous influence rootstocks have over scions, and the fruit-grower knows how important it is that he should have his fruit trees grown on the type of rootstock which will give him the form and size of bush or tree that he needs to suit his soil and site.

Years of work and research have gone into the sorting and sifting of stocks which were in use in this and other European countries, with the result that there are now available rootstocks of known performance, which are exceptionally true to type. So that nurserymen and propagators of fruit trees might keep their rootstocks pure and healthy, an inspection scheme was instituted in 1946. It is no exaggeration to say that this scheme has helped very materially to "tidy up" the stocks true to type. Now that fruit tree viruses are appearing in some of our plantations, it may be extremely fortunate that such a scheme is in existence.

Very soon, some new fruit tree rootstocks resistant to the Woolly aphid are likely to be available. These will be known as the Malling/Merton series. M/M 106 is an example.

**Importance to the Grower** Although there are other crop certification schemes in operation, enough has been said to indicate the importance of such schemes to everyone engaged in fruit or potato production, whether commercially or domestically. It may be mentioned here what a tremendous task has devolved upon the Ministry in training N.A.A.S. officers to act as competent inspectors under the various certification schemes. Different varieties of bushes and plants have to be recognized by such characters as the shape and coloration of leaf, petiole, form of bush or plant, etc. But so experienced have these officers become that recognition of variety is accomplished at walking pace. In fact, it is only at that pace that all the crop inspection work can be completed in the short time available.

When the inspections are concluded in respect of any one scheme, a register is compiled giving the variety, acreage (or number of bushes in the case of black currants), and the names and addresses of the growers of certified stocks. This information is invaluable to the grower seeking a source of healthy planting material, and these registers may be obtained from the Ministry.

Publicity is given every year to all crop certification schemes well in advance of the date by which applications must be received. Explanatory memoranda accompany the application forms, but anyone wishing to know more concerning any of these schemes has only to apply to Horticulture Branch I of the Ministry of Agriculture and Fisheries, Whitehall Place, London, S.W.1.

# THE CATTLE OF BRITAIN

## 9. GUERNSEY

IN tracing the history of the Guernsey breed, it is necessary to go back more than 900 years, to the time when dairy cattle were first introduced into the Island of Guernsey by a band of Breton monks. These monks gave the islanders instruction in agricultural methods, and in this connection they are believed to have imported cattle of the *Froment de Leon* strain from their native Brittany. The markings of this breed are similar to those of the Guernsey and they possess the same characteristics of docility and hardiness. Other monks, who came from Cherbourg some years later, brought to the Island the large brindled breed from the Isigny district of Normandy, a breed capable of high milk yields on indifferent pastures. Thereafter, the crossing of these two breeds produced the Island's own famous breed, which combines the great milk potential of the "Isigny" with the hardiness and quiet temperament of the *Froment de Leon.*

A characteristic of the "Isigny" was the deep yellow pigment of the skin, which is considered to have had great bearing on the colour of their milk, and this characteristic is still evident in the Guernsey of today.

Tethering, which has been practised on the Island of Guernsey for centuries, has also had an influence on the breed, contributing to its docility, as well as making for thriftiness. Even when free to roam, the Guernsey will crop the grass close within a small radius.

The present-day Guernsey cow is fawn and white in colour and wedge-shaped. It is clean-boned with an alert expression and general poise, indicating balance and symmetry of movement. The fine, long head has a lean face, broad between the eyes and with a broad muzzle. The nose should be flesh-coloured. The black nose, which is a trace of the "Isigny", is a disqualification in the show ring. The head is surmounted by fine curved horns and the neck is long and thin, with a clean throat. The backbone rises well between the shoulder-blades, the deep, wide chest extending between and behind straight, wide apart and squarely set fore-legs. The back is broad and level across loins and hips, with a long and wide rump. Hook bones are wide apart and thighs long and flat. The fine, neatly set-in tail reaches to the hocks and ends in a good switch. The hind-legs, which should be well apart, have the point of the hock directly in line with the pelvis bone. The soft, pliable udder is long and capacious, with a level sole extending well forward, the rear attachment being high and wide. Milk veins are long and prominent, with large wells, and are clearly defined on the udder.

Purity of the breed had already been established by the time that the Royal Guernsey Horticultural Society had published its first Herd Book in 1875, as a law was passed on the Island in the early nineteenth century which forbade the importation or reimportation of any live cattle. This law was, and still is, rigorously enforced; not even animals sent to England for show purposes can return. The result of this is that pedigree herds anywhere in the world can trace back their ancestry to the Island through their foundation stock and are assured of purity much further back than any Herd Book can show.

The Guernsey cow is renowned for the amazingly high butterfat content of her milk, the rich golden colour of which has earned Guernseys the title of "The Golden Butter Breed". The average butterfat content of Guernsey milk is around 4.5 per cent, but it is often much higher and has ranged as high as 7 per cent. Cows which produce 1,000—1,500 gallons of milk per year are

being recorded in ever-increasing numbers, and many herds produce an average of 1,000 gallons over the year. Producers of Guernsey milk are entitled to a quality premium of 4d. per gallon.

The Guernsey is a long-lived animal and has been known to reach maximum productivity at 8—10 years of age. The heifers come into profit with their first calf at 2 years 3 months to 2 years 6 months, giving from 6,000 to 8,000 lb. of milk in their first lactation and then milking and producing a calf each year up to the age of fourteen, or over.

Guernseys have achieved considerable success in the open herd competitions in this country. An outstanding achievement of the breed has been the winning of the Bradfield Competition (Bull and its Progeny), over all other breeds, for three years in succession. In 1951 the Bradfield Trophy went to "White Ladies Majestic", in 1952 to "Kentwyn Imperial Robert", with two other Guernsey bulls in second and third place; and in 1953 to "Coutanchez Supreme 4th". In 1949 Guernsey herds were placed first and second in the National Dairy Herds Competition, and in 1949, 1950 and 1951, the Cup presented by H.M. King George VI at the Royal Counties Show for the best herd of all breeds in the area in which the show was held, was won by Guernsey herds, a success which has been repeated this year.

A recent individual achievement has been the breaking of the world's butterfat production record for the breed by "Fascination 3rd of the Pastures". Her figures were 13,081.00 lb. of milk at 10.58 per cent B.F. in 362 days. This gives a butterfat production of 1,383.97 lb., which is nearly 200 lb. more than the previous top production in the United Kingdom and considerably higher than the present American record.

Guernseys have been exported all over the world and are to be found in such diverse climates as those of Japan, Transjordan, Peru, Argentine and the West Indies, as well as being widespread throughout the U.S.A., Canada, Kenya, South Africa and Australia.

In this country, too, the Guernsey is gaining in popularity, with many producers switching over to pedigree Guernseys as the basis of their dairy herds as it becomes more widely known that this is a hardy breed yielding milk of the highest nutritive value with a unique colour and flavour which appeal strongly to the consumer. In fact, the commercial dairy farmer realizes that in Guernsey milk he has a "quality" product which sells itself.

*Colonel T. M. Ker,*
*Secretary,*
*English Guernsey Cattle Society*

## 10. HEREFORD

FOUNDED on a type of cattle prevalent in the county of Hereford centuries ago, the breed has been developed largely upon its hardiness and on its early-fleshing qualities. While the first of these recommendations has been preserved naturally ever since Tomkins first began to apply his theories of selection to practical test—the second, that of early maturity, has been confirmed and strengthened during a period of intensive breeding covering a century and a half. Individual breeders, above all, have had their influence, but one of the most predominant factors in concentrating these excellences was the closing of the Herd Book immediately after 1883, against all cattle whose sires and dams had not been registered. Thus the purity of

pedigree Herefords has a recorded tradition extending over more than seventy years. Indeed, many unregistered bullocks seen in the western marts of England and the Welsh Border counties are today pure bred in that they have come from registered parents for many generations.

Natural rearing is largely practised throughout the Hereford breed, and to the fact that the cows often calve in the open and that many herds live out in the pastures throughout the year is attributed the breed's freedom from tuberculosis; the Society was one of the first to organize attested cattle sales. Breeders from overseas and especially from the West, are often amazed to find the constitution, depth, and finish of animals reared here under severe conditions.

What are the chief characteristics which have made the breed such a universal favourite? The colour and markings are too well known to need description here, except to say that the rich red body with white face, crest and underline give a striking appearance of uniformity to the breed. These colour markings, being a dominant factor, type mark the calves, no matter what breed of cow the Hereford bull is crossed with.

Natural aptitude to fatten and early maturity are perhaps the predominant characteristics of the breed. They have always been carefully maintained and developed, with the result that no breed can be marketed as prime beef of greater weight for age in so short a time and at so low a cost.

Hereford cattle have always been and are still bred and reared under the most natural conditions, and, with the exception of the bulls and a few show animals, are seldom housed. The cows and heifers run out in the pastures all the year round, receiving no extra food, except a little rough hay or straw during the most severe weather and at calving time. It is, moreover, the practice of many breeders to allow their cows to calve out in the open. This treatment has the effect of keeping the cattle healthy and making them extremely hardy, and it is for this reason that Herefords have gained a world-wide reputation for withstanding every kind of hardship.

Hereford cows are splendid mothers, rearing their calves well and maintaining their own condition at the same time. They have exceptionally long lives as breeders. Dropping their first calf usually at about two and a half years of age, they continue breeding up to fourteen and fifteen years, and many instances occur of cows breeding regularly up to a much greater age.

It is claimed with confidence that the Hereford bull is the most prepotent sire of all breeds of cattle. Whether crossed with pedigree or mongrel, he invariably transmits to his progeny his own great qualities and characteristics. In addition, the experience of ranchers has proved that, owing to their great activity, where Herefords are used fewer stock bulls are required. The use of a Hereford bull ensures a high percentage in the calf crop, an immediate grading-up of the stock, in which the characteristics of the sire are unmistakably evident and, owing to the hardiness of the breed, a large proportion of calves at branding time. In a total of 615 Hereford bulls tested by the Russian Government before World War II, "only 0.98 per cent manifested sexual impotence".

Herefords are unsurpassed as grazers, and fatten readily on grass alone. The breed has for this reason always been in great demand in the principal English grazing districts. Grass-fed Herefords are in great favour on the London markets, and command top prices, the carcass having that marbled, well-mixed appearance which butchers prefer. They are also far less fastidious in regard to their food, and fatten quickly on forage that other

animals may reject. In 1946 a writer in *Queensland Country Life* stated: "As a converter of roughage into good beef, the Hereford stands alone".

Throughout the world Herefords have proved themselves to be, without doubt, the best ranching cattle. Where droughts occur and long distances have to be covered in search of food and water, the great hardiness of the breed is clearly seen; in fact it can safely be stated that Herefords will live and get fat where most other breeds will die. The Hereford is a plucky, gallant beast; he will put up a great fight against adversity and in pursuit of a livelihood, and for this reason has gained considerable favour under range conditions.

The future of the Hereford is secure so long as man needs beef for food. Overseas he will always be the king of the range, and the great beef-producing countries will always need fresh blood from England to keep up their standard of excellence.

At home, the breed is spreading over districts throughout the British Isles, where its presence has previously been almost unknown, and the value of the Hereford cross in the store cattle trade, with the hallmark of the white face and that extra weight for age, is becoming appreciated to a greater extent over an ever-widening area as the years roll on.

*J. H. Everall,*
*Past President,*
*Hereford Herd Book Society*

# SOIL BLOCKS FOR SWEET CORN

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Experiments at Bayfordbury indicate that earlier maturity and higher yields of sweet corn can be secured by the use of soil blocks.

ATTEMPTS to produce early crops of sweet corn in England by early sowing outdoors often result in failure, owing to too low a soil temperature, which prevents germination, or too wet a soil, which rots the seed. Young plants are also often damaged by Frit fly and wireworm, and not infrequently pulled out by rooks and pigeons. To find a method of overcoming these difficulties, experiments were made at Bayfordbury in 1951–52 on the use of soil blocks for raising plants for subsequent planting in the field.

Comparisons here between the use of soil blocks and pots for raising tomato, lettuce and cucumber, have shown that plants put out from soil blocks grow away more quickly than those from pots. This is a point of importance in the production of early sweet corn for market, probably related to the type of root system developed by plants grown in this way.

**The Method** In these experiments we used the sweet corn varieties John Innes Hybrids I and II, sowing at two dates—the first and fourth weeks of May for the years 1951 and 1952. Single seeds were sown in medium-sized machine made soil blocks (approximately equivalent in size to 3½-inch pots) in John Innes Potting Compost No. I (JIP1). The prepared blocks were placed in aluminium seed trays (eight per tray) and the seedlings raised in a temperature of 55°F. They were grown in the normal way by

transference to cold frames when two inches high and, after hardening off, planted out when about six inches high. The young plants were carefully planted one foot apart in rows two feet apart, and watered in to avoid check to their growth.

At the same dates of sowing the soil blocks, sowings were made direct in the field, using two seeds per station at the same spacing as that of the soil block planting. After complete germination, the plants were thinned to one per station and, where necessary, spare plants were used to fill up the gaps.

The field used at Bayfordbury for these experiments is a fertile, medium clay loam which had been ploughed and manured in the autumn and brought into good condition for sowing and planting.

**The Results** The results of the experiment (summarized in Table 1) show the beneficial effects that the use of soil blocks confer on the production of sweet corn. Loss of germination in soil blocks sown indoors is negligible, compared with outdoor sowings; and the final stand is always higher where plants have been raised in soil blocks. Plants from blocks were a little taller, and in both varieties ears were picked earlier. Sowings made during the first week in May cropped about a fortnight earlier than those sown during the fourth week, and the yield of marketable ears shows an increase of about 20 per cent when soil blocks are used. The quality of ears, both in length and weight, show no differences between the treatments, so that plants raised in soil blocks produce more ears of equal quality than those from seeds sown directly outdoors.

**Table 1**

**Effects of Sowing Sweet Corn Seed Directly in the Ground, or Transplanting Seedlings in Soil Blocks**
(Pooled Data for 1951 and 1952)

| Variety | Date and Method of Sowing | Plant Characters | | | Yield | | Ear Characters | |
|---|---|---|---|---|---|---|---|---|
| | | Stand | Height | Mean Earliness | Ear No. | Cob-bage* | Weight | Length† |
| | | *per cent* | *inches* | | *per cent* | | *ounces* | *inches* |
| John Innes Hybrid I | *1st wk May* | | | | | | | |
| | Direct | 59 | 38 | Sept. 7 | 80 | 47 | 8 | 6.7 |
| | Soil blocks | 80 | 41 | Sept. 1 | 108 | 86 | 8 | 7.0 |
| | *4th wk May* | | | | | | | |
| | Direct | 93 | 46 | Sept. 20 | 102 | 95 | 9 | 6.9 |
| | Soil blocks | 99 | 47 | Sept. 15 | 123 | 122 | 9 | 6.7 |
| John Innes Hybrid II | *1st wk May* | | | | | | | |
| | Direct | 51 | 35 | Sept. 11 | 90 | 46 | 8 | 6.6 |
| | Soil blocks | 79 | 42 | Aug. 29 | 115 | 91 | 11 | 7.1 |
| | *4th wk May* | | | | | | | |
| | Direct | 88 | 43 | Sept. 25 | 87 | 77 | 11 | 7.0 |
| | Soil blocks | 91 | 46 | Sept. 15 | 95 | 87 | 11 | 7.3 |

* "Cobbage" is the actual ear yield per 100 stations
† Data for 1951 only

Soil blocks have significant effects of percentage stand, height, earliness and ear number, but have no effect on ear weight. It is of especial interest to note that the two varieties react differently with regard to percentage stand according to the treatment. Sowing date also affects percentage stand, height and earliness, and the interaction of soil blocks and time of sowing has a marked effect on percentage stand.

The uniformity results are given in Table 2, uniformity being judged as the number of pickings of marketable ears required to harvest a row completely. The use of soil blocks does not apparently influence this character.

**Table 2**

**Uniformity* of Sweet Corn Ears Ripe for Market**

| Variety | Date and Method of Sowing | 1951 | | | Total No. of Ears |
|---|---|---|---|---|---|
| | | Sept. 10 | Sept. 17 | Sept. 24 | |
| | *1st wk May* | *per cent* | *per cent* | *per cent* | |
| John Innes Hybrid I | Direct | 78.6 | 14.3 | 7.1 | 14 |
| | Soil blocks | 60.7 | 32.1 | 7.1 | 28 |
| | *4th wk May* | | | | |
| | Direct | 55.6 | 35.6 | 8.9 | 45 |
| | Soil blocks | 44.4 | 35.2 | 20.4 | 54 |
| | *1st wk May* | | | | |
| John Innes Hybrid II | Direct | 33.3 | 33.3 | 33.3 | 12 |
| | Soil blocks | 78.6 | 21.4 | — | 28 |
| | *4th wk May* | | | | |
| | Direct | 30.0 | 55.0 | 15.0 | 40 |
| | Soil blocks | 42.4 | 51.5 | 6.1 | 33 |

| Variety | Date and Method of Sowing | 1952 | | | | | Total No. of Ears |
|---|---|---|---|---|---|---|---|
| | | Aug. 12 | Aug. 22 | Sept. 9 | Sept. 14 | Oct. 6 | |
| | *1st wk May* | *per cent* | *per cent* | *per cent* | *per cent* | *per cent* | |
| John Innes Hybrid I | Direct | 4.5 | 36.4 | 59.1 | — | — | 22 |
| | Soil blocks | 65.9 | 18.2 | 15.9 | — | — | 44 |
| | *4th wk May* | | | | | | |
| | Direct | — | — | 10.3 | 34.5 | 55.2 | 29 |
| | Soil blocks | — | — | 73.3 | 13.3 | 13.3 | 45 |
| | *1st wk May* | | | | | | |
| John Innes Hybrid II | Direct | 3.7 | 29.6 | 66.7 | — | — | 27 |
| | Soil blocks | 86.0 | 9.3 | — | 4.7 | — | 43 |
| | *4th wk May* | | | | | | |
| | Direct | — | — | 10.5 | 10.5 | 78.9 | 19 |
| | Soil blocks | — | — | 58.5 | 34.1 | 7.3 | 41 |

*Uniformity is judged by the number of pickings required.

**Summary** Soil blocks are clearly suitable for raising sweet corn for planting in the field. They will avoid the hazards of low soil temperature and wet soil conditions, which cause heavy losses when early sowings are made outdoors in an attempt to produce early crops. Sweet corn planted when well developed is not attacked by Frit fly, which harms only germinating seeds and damage by birds is avoided. Sweet corn cannot be transplanted successfully from seedbeds: the only means of transplanting is from pots or soil blocks. This adds considerably to the costs of production, which should be made good by the certain results, earlier pickings and increased yields of good quality ears.

# FARMING AFFAIRS

**Quality Corn** For the first time since early in the war sales of grain from our farms are decontrolled, but growers are reminded of the need to take the necessary steps to qualify for deficiency payments. Quality premiums are likely once more to be paid for good samples of all kinds of grain, while lower prices can be expected for the indifferent lots. The deficiency payments system does not narrow the gap between the price received for the best and that obtained for the worst, and the grower who wants to get the best return has every incentive to strive after the highest possible price for his corn.

Grain quality depends to some extent on factors outside the control of the grower, but much can be done during harvesting and afterwards to produce a grain sample that will command a good price. If past experience is any guide, the higher premiums will be paid for barley to be used for malting. At harvest time any barley crop that is likely to be sold to the malting trade will need very careful treatment if a first-quality sample is to result. Time of cutting is very important. Cutting too early can easily reduce a potential prize-winning barley to one of very moderate quality.

For all kinds of grain the setting and operation of the combine harvester or the thresher can have a considerable influence on the market value of the sample obtained. Cracked or damaged grain is undesirable and is usually the result of a too closely set drum or too high a drum speed. In combined grain excessive amounts of rubbish and greenstuff, which commonly arise through cutting too low or operating at too high a speed, have obviously to be avoided.

Ideally, all grain should be harvested when the moisture content is at a level which will permit of long storage. Our climate is such that this is rarely possible, but care at harvest time can appreciably reduce the amount of corn that needs to be dried. Starting the combine too early in the morning or after rain and cutting too low in weedy crops will be certain to result in an unnecessary amount of damp grain, and possibly a reduction in its market value.

The new marketing conditions operating this harvest may well see the corn trade expecting a return to something near pre-war standards in the preparation of grain for sale. The best prices will not be paid for parcels containing weed seeds and trash or a lot of small grains. It should be more profitable to keep these on the farm after treating the grain on the farm dresser.

Already there are indications that buyers of corn are more insistent that the sample truly represents the bulk quality. The grower who expects to get a good price for his corn will be careful to draw a sample that is fully representative of the bulk. The corn market this year may well present many opportunities to obtain worthwhile additional payments for grain of good quality, and careful harvesting and handling should thus be very well rewarded.

L. W. Osborne

**Farming Cameo : 44. South Huntingdonshire** The southern district of Huntingdonshire is intersected by two main roads—the Great North road running centrally through the area from St. Neots to Norman Cross, and the Cambridge-Thrapston-Kettering road running east to west. The Great Ouse meanders through the district but the meadows adjacent are not too productive, since flooding is likely after

any heavy rainfall. The arable fields in this valley grow good crops of cereals, potatoes, sugar beet and sprouts in showery seasons, but in dry years the fields soon burn up due to the gravelly nature of the soil and subsoil.

There are many other soil types in the area, and as a result the farming pattern varies considerably. In the southern parishes on valley gravel are grown many acres of Brussels sprouts and other market-garden crops such as parsnips, carrots, cabbages, parsley, marrows, onions, leeks and lettuces. On the west there is much boulder clay, and with the coming of the crawler tractor this land has produced some excellent crops of autumn-sown cereals. Potatoes and sugar beet were introduced here during the war and most farmers have continued to grow these crops in their rotations. It is always a matter of great concern to keep this land dry, and many acres are drained each year either by tile drainage or mole-and-tile systems; often, however, the fields are "burst" to let the surface water through to the existing tile drainage system. Between the boulder clay and the valley gravel there is some Oxford Clay, which is farmed in much the same way as the other clay land. The rotation is usually two white straw crops (wheat and barley), followed by either sugar beet or potatoes, another white straw crop, then either peas or beans. Occasionally the second straw crop may be undersown with clover or trefoil. Ley farming has become much more common in this area since the war.

The provision of water in the summer months was once a great problem in the western part of the district. The only supply was from ponds which were liable to dry up, and water had to be carted from the river, which sometimes meant a journey of 12–15 miles each way. Now, main water as well as elecricity is available in most of the outlying parishes.

Livestock farming is not one of the main enterprises of southern Huntingdonshire, but it is interesting to record that more stock are now being kept on fewer acres of grass and that sheep are being reintroduced. Breeding flocks of the latter are kept, the lambs being sold out in the autumn as stores or, where sugar beet is grown, folded on the tops and sold fat. Some hogs are bought to run as scavengers on the arable land after harvest, and these are fattened on sugar beet tops, kale or rape.

The district also includes in its north-eastern corner some peaty fen—actually part of Whittlesey Mere. Here the farming is intensively arable, normally based on a three-course rotation of cereal (usually wheat)—sugar beet—potatoes. A few farmers grow celery, carrots, and mustard for seed. Rye is grown on the very acid peats. The whole of the fen area is artificially drained; water is pumped from the ditches into main water channels, and thence into the rivers. This is extremely productive land and is farmed by experts who are very aware of the problems of trace element and manurial deficiencies; acid soils are common and lime is widely applied.

Very few cattle are kept on the fens, the strawyards often being filled by agisted stock by arrangement with the Northamptonshire and Leicestershire graziers. It was in this district that the deficiency of the trace element copper was discovered in 1947, and trials have since been carried out every year on cereal and sugar beet crops with some startling results.

Although this fenland is fifty miles from the sea, it is barely above sea level and is very subject to frost damage in the spring. Thus early planting of potatoes and drilling of sugar beet are risky operations. Soil blowing in a dry season during March and April is always feared. Bog oaks are numerous and have to be dug out when caught by the plough. Unfortunately, the wood is of little value.

A good general view of the district can be obtained from the main railway line about 10 miles north of Huntingdon. From this vantage point one gets the impression of a vast, flat expanse of very fertile land farmed with great care and attention. None of the land is more than 200 feet above sea level and, with the rainfall averaging little more than 18 inches a year, and such a diversity of soils, it is no wonder that it offers such a great variety of farming and farming problems.

Frank Coles,
*District Advisory Officer*

**The Mechanic on the Farm : 5. Spare Parts** If all overhauling work could be planned weeks ahead and if no machines ever broke down in the field, there would be no need to stock spare parts on the farm. In practice, however, a carefully chosen stock of parts, kept handy in the farm workshop, can save a good deal of time when emergency repairs have to be undertaken or unexpected renewals of wearing components have to be made. But if the local agent-stockist has a good range of spares, it is wise to keep this emergency supply on the farm down to the minimum, for spares are expensive and they earn no money while they are lying idle on the shelf. Therefore, considerable thought must be given to choosing what items to have on hand. This is not difficult in the case of wearing parts such as ploughshares, because the frequency of need for replacement is soon learned. The occurrence of breakages, however, cannot be forecast as accurately, although experience will soon enable a good guess to be made about the pieces to keep handy. Indeed, in the long run the best way of arriving at a proper balance between no spares at all and a stock too large to be economical is to keep a strict record for a season or two. All breakages and other causes of replacement should be noted; also the delays and the cost of replacing the damaged or worn parts.

Stocktaking need not entail much office work. All that is wanted is a running list of items that are getting short. A paper or card securely fixed to the wall is better than a notebook for this job.

Small spares, and such things as nuts and bolts, should not be left on open shelves but placed in boxes, drawers or bottles. Boxes and tins, clearly labelled, should be used for screws, nuts and nails. In the case of items like split pins and washers, when the correct size has to be selected from the wide range of shapes, thicknesses and lengths that accumulates, glass jars are often the most convenient receptacles. Labelling is not needed and a rough choice for size and shape can often be made without undoing all the jars. If screw-top jars with metal caps can be obtained for this purpose, the lids can be nailed to the underside of a shelf, or to a wooden rafter or ceiling. Then the jars can be suspended by screwing them into the caps, and their contents will not only be in view, but can be reached easily. Moreover, there will be no danger of mislaying the cap!

Stocks of nuts and bolts and split pins tend to increase rather than lessen, because items of this kind are saved from scrapped implements, and because damaged items which have been replaced when implements are being repaired are frequently not discarded but are put away in the hope that they will come in for some other job. All the same, some newly bought stock should be added to the collection from time to time, for damaged screw threads can never be relied upon, and splitpins become brittle when they have been bent over and then re-straightened several times.

H. J. Hine

**Royal Show at Windsor** For the first time since 1939, and for the fourth time in its history, the "Royal" returned this year to the truly glorious setting of Windsor Great Park. After the intermittent rain of the previous few days, the pessimists amongst the early-comers were freely prophesying another "Three Counties", but fortunately they were confounded and indeed the showground had dried out nicely in time to greet Her Majesty the Queen, the Society's President and Patron on the second day. And the 143,045 people who paid for admission in the four days—the highest attendance since Shrewsbury in 1949—were well rewarded by one of the largest and most picturesque shows in the long history of the R.A.S.E.

The total livestock entry of 4,844 animals was a record, and necessitated a last-minute addition of 35 acres to the ground, bringing the area of the showground up to 151 acres. The greatest stock increase, compared with last year, was in the pig classes (1,187 against 864), but it was also pleasing to see the sheep entries up by about 70. All the well-known breeds were represented in the cattle classes and standards were extremely high. Aberdeen-Angus topped the poll in the beef section with 114 entries, followed by the Herefords with 110, while, in the dairy and dual-purpose exhibits, the greatest numbers were recorded by the Ayrshires with 234 entries, followed closely by the Guernseys with 230. The greatest triumph was, however, achieved by the Shorthorns, which provided both the winning pairs for the Burke Trophies, awarded for the best male and female breed champions in the beef and dairy sections. The Queen's Cups for the best beef bull and dairy female went to Mr. O. S. Hellyer's Hereford bull "Eaton Eastern Venture" and to Mr. T. Loftus's British Friesian cow "Weeton Cutie 11th", respectively.

The highlight of the ring events was the daily parade of historic vehicles, which ranged in dignity from the Queen's State dress landau to a coster's cart, and in size from Shillibeer's original omnibus to Queen Adelaide's miniature barouche. It was indeed a happy and refreshing reminder of the days of grace and leisure long past. The beautifully staged old-time meet of the Royal Buckhounds is also worthy of mention.

But the heart of any Royal is, of course, always the animals, and this display of what must surely have been the biggest collection of livestock ever seen in this country, coinciding, as it did, by a peculiar quirk of fate with the end of meat controls, was a heartening potent of Britain's ability to produce the best. The need for quality production was undoubtedly uppermost in the minds of the great majority of exhibitors, and into this framework the Ministry's own exhibit, with its theme of "Better Quality and Lower Cost", fitted very neatly.

**FAO after Ten Years** In *Growing Food for a Growing World*, FAO reports to 71 countries on its work during 1952-53, and takes the opportunity of reviewing something of the Organization's progress during the past ten years. In its aim of a better-fed world, as the Director-General, Norris E. Dodd points out in his foreword, "The need for action is more urgent than it was 10 years ago, in spite of the progress already made, because people do not gladly suffer what they believe they need not suffer. As the world has become more one community, the conviction has grown in every village and on every farm that poverty, hunger and misery need not prevail if people can only be helped themselves with the means that modern science and organization provide."

With more mouths to feed, a higher food production is needed, and to this end much advice has been given on all aspects of farming under all kinds of conditions. Farmers, who once were content to work their farms by the age-old methods of their forefathers, are now alive to the fact that their land can be made more productive by the help of modern science and up-to-date machinery and implements. Modern methods of irrigation, for example, have helped to solve the problem of near-famine which existed in Syria, where rainfall is uncertain. In Nepal, experts are assisting the Government in its efforts to improve livestock production and control animal diseases. Better dairy cattle are being reared and milk production is thriving.

Under the auspices of FAO, the Expanded Technical Assistance Program (ETAP) was set up in 1953 to teach the technicalities of agriculture and its allied subjects, such as fishing and forestry. Over 300 people from 41 countries have been able to study through ETAP, and will be able to serve their own people better in these projects when the visiting specialists have returned to their own countries.

Public health is a main factor in the plan for improved conditions everywhere, and under the World Health Organization a great deal of research has been carried out on diet and its influence on health. Through that body, the peoples of many nations are learning the nutritional values of foods, and their children are reaping the benefit of that knowledge.

The report is obtainable from H.M. Stationery Office, P.O. Box 569, London, S.E.1., price 2s. 6d. (2s. 9d. by post).

**A Record Forestry Year** Britain's re-afforestation programme continues to make great strides. In the year ended September 30, 1953, plantings by the Forestry Commission amounted to 67,610 acres, exceeding the previous year's total by almost 6,000 acres, and representing the largest area of plantations made in any one year since the Commission's inception in 1919. The total included nearly 25,000 acres of felled woodland replanted. More than 104 million trees were used to form the new plantations, and a further 14 million were needed to replace earlier failures elsewhere.

Produce disposed of from the Commission's forests during the year amounted to 12 million cubic feet (about ¼ million cubic feet less than in 1951-52). Nearly 80 per cent of it was obtained from thinnings. Sales to the timber trade declined to just over 2 million cubic feet, but there was an increase in the amount of timber dispatched to the mining industry (3¼ million cubic feet).

Private forestry added a further 18,000 acres to the figure of new plantings during the year, including 10,000 acres in dedicated woodlands. This was an increase of 3,000 acres on the previous year. It is now confidently expected that within the next few years the annual rate of planting by private owners will reach the objective of 25,000 acres. The number of applications for felling licences on private land made during the year were less than in the previous year, no doubt as a result of falling timber prices. Authorized fellings amounted to 68¾ million cubic feet of timber.

Despite the record plantings, the gross expenditure of the Commission was virtually the same as in the previous year. To achieve this, it was necessary to postpone or restrict some of the ancillary work a little, and fewer houses and new roads were built. Nevertheless, the total of 343

houses completed, 301 under construction and 328 miles of main roads is a not inconsiderable contribution to the needs of the industry.

The rate of acquisition of land by the Forestry Commission gives some cause for concern as to the possibility of keeping up the increased rate of planting. Only 53,635 acres, comprising 22,252 acres of bare land, 27,768 acres of felled or devastated woodland, and 3,615 acres of standing woods were obtained during the year, bringing the total area of land acquired by the Commission since 1919 to just under 2 million acres.

Fire, the greatest danger in the forest, destroyed 532 acres in 1952-53. As in the past, railways caused over half the 1,253 fires, while the public were known to be responsible for 75.

These facts and a good deal of other interesting information on the management of Britain's woodlands are contained in the *Thirty-fourth Annual Report of the Forestry Commissioners*,* which has recently been published by H.M. Stationery Office.

## BOOK REVIEWS

**The Economics of Crop Spraying.** (Farmers' Bulletin No. 16). Farm Economics Branch, School of Agriculture, Cambridge. 2s.

One of the most remarkable advances of the post-war period of British agriculture has been the rapid development of new crop protection chemicals. The introduction of cheap and simple hydraulic-type, low-volume sprayers has played a major role in this expansion, particularly for the application of hormone weed-killers. High-volume machines are still essential for the application of certain materials, but most of the modern types are adaptable to low-volume work.

Until recently there has been little reliable information on the economics of spraying. This report, based on data from a representative sample of farmers, analyses the average cost per acre of operating both types of machine. As the acreage sprayed increases, the operating cost is reduced, and an attempt is made to deduce the minimum acreage that must be sprayed before this cost falls below the average contract charge and the purchase of a sprayer by a farmer becomes uneconomic.

The benefits of spraying are discussed and it is shown that in cereals a very modest yield increase covers the cost of treatment. It is pleasing to note that although the original survey was made in 1952, all cost data refer to the 1954 spraying season. To supplement the data on weed-killers in the text, there is an appendix devoted to the cost of spraying with other materials.

This well-timed publication is practical in its approach and easy to follow. Anyone who is considering buying a sprayer will find it invaluable.

*T.C.B.*

**The Place of Mechanisation in Modern Farming.** (Bath and West Society Pamphlet No. 23). C. CULPIN. 2s.

The use of machinery on farms has become so commonplace of recent years that it is well sometimes to stop and think of the place it really does occupy and to speculate on what more it may yet achieve. In this pamphlet Mr. Culpin sketches many aspects of the subject, and, besides quoting figures to show the increases in the numbers of machines, mentions some developments that are needed or likely; power-driven cultivators, accurate fertilizer-placement drills or contrivances to ease the handling of silage, for example.

That some machines are too costly for individual ownership by those farming small acreages is accepted, but in this pamphlet we are reminded that joint ownership or participation in a pool arrangement are sensible, although not yet popular, ways of keeping capital investment on machinery down to a reasonable figure. Not all farmers know how much each tool costs to operate, and here the author's few words about annual depreciation and the calculation of operating costs will be helpful. *J.C.G.*

*Obtainable from sale offices of H.M. Stationery Office, or through any bookseller, price 3s. (3s. 2d. by post).

**Profitable Milk Production. Part I. Some Problems of Milk Production on Arable Farms.** Farm Economics Branch, School of Agriculture, Cambridge University. 2s. 6d.

The Cambridge School of Agriculture set out to show in this latest bulletin how a group of progressive farmers have adapted their systems to prevent their costs rising faster than the price of milk. The theory behind it is that few increases in milk prices can be expected now that the demand for liquid milk is satisfied, and that further adaptations in production, such as a greater reliance on home-grown foods, more winter milk and changing from hand to machine milking, may be difficult, since there is a certain finality about them all. In future, therefore, the report says, milk producers will need to have a "firm grasp of the economic principles underlying production" if they are to maintain their profits.

The main part of the bulletin is devoted to the demonstration of these principles, using the technique of a series of budgets – actual and imaginary. These budgets are made to show how the three components determining profit per cow – yield per cow, receipts per gallon, costs per gallon – must all be considered by the producer. They are then used to examine the important factors which bear on profitability. The most profitable yield, the best size of herd, and the choice between winter or summer production, are dealt with in this way.

The examples are drawn from milk production in an arable area, and consequently the findings may not be applicable to milk production in a grassland district. But the method of approach is applicable to all systems of milk production, so that, as an illustration of the application of the budgetary approach to the problems of dairy enterprise adjustment, the bulletin should be of use to farmers in a far wider area than the Eastern Counties.

*S.T.M.*

**The Legal Status of the Tenant Farmer in the Southeast.** CHARLES S. MANGUM. Oxford University Press. 60s.

One would not expect a book dealing with the law concerning landlord-and-tenant relationships in the south-eastern states of America to be of interest in Britain, but the author presents his subject so attractively that it can in fact be read with a good deal of pleasure. The tenancy complications which can beset a farmer in the eleven states comprising this area are fully described, and our interest in discovering the complexity of the law must be accompanied by relief in finding that, by comparison, our own landlord-and-tenant arrangements seem straightforward. In Britain, land tenure has evolved slowly and sensibly, keeping pace with agricultural development and changing social and economic influences. Our system passes the test laid down in *F.A.O. Study No.* 26, which says that a good tenancy system should give adequate security of occupancy to the actual cultivator and be a secure investment to all classes of investor.

Can it be said that tenancy arrangements in the south-eastern states of America pass this test? The impression given by Mr. Mangum's book is that farming in the past might be better described as food production for maximum profit. There has been little evolution of a tenancy system as we understand it, and an immense number of court cases concerning the interpretation of contracts appear to provide the main body of the law on the subject. Other factors affecting the tenant's status have been the growth of relatively few crops, habitual dependence on credit, uncertain price levels, and the profit-sharing system instead of a cash rent agreement with his landlord. In fact, the latter's participation to a varying degree in providing what we call working capital is probably the most unusual feature to the British reader.

The book ends with a moderately worded and thoughtful chapter on suggested reforms. It is interesting to note that in a country where free enterprise is cherished, there is a growing awareness of the need for some regulation of its land tenancy system.

As with most American publications, the book is well produced, attractively laid out and carefully indexed; it can be recommended to all interested in the subject of land tenure.

*R.G.A.L.*

**The Lily Year Book, 1954.**
**The Rhododendron and Camellia Year Book, 1954.** Royal Horticultural Society. 10s. each.

The ordinary gardener, preoccupied as he is with the unending battle against time, may be forgiven for wondering if there is enough new to say about lilies, rhododendrons and camellias to warrant the yearly publication of books about them. But the ordinary gardener, until he becomes obsessed with a speciality, does not begin to appreciate the mental attitude of the connoisseur. The lily enthusiast, for example, loves to read about experiences of lily growers in Sweden, or to study reports of lily shows in North America or New Zealand. His curiosity about the origins of lilies is insatiable, and he is as interested in the personalities in the lily world as he is in the behaviour of the lilies themselves. The genus *Nomocharis*, and also the Notholirions, are now included in the purview of the lily enthusiast, and this year's *Lily Year Book* contains interesting information on both these genera. If the cult of the lily is not so widespread as it was, say, fifteen years ago, there is evidence that it is increasing in popularity.

Turning to the rhododendron and the camellia, it is plain that devotees of these two genera are now to be found not only among the owners of large estates, but also among those who garden half an acre. Prices of these plants are gradually coming down, and the interest in them may be expected to increase *pro rata*. *The Rhododendron and Camellia Year Book* for 1954 touches upon every aspect of the cultivation of the two plants, and such subjects as "Polythene Plastic as an Aid in Grafting Evergreens," "New Treatment for Iron Chlorosis," and "Search for the Yellow Camellia" give some indication of the breadth of vision in this field. There is, of course, the purely botanical aspect, exemplified by the article on "Hybridization of Rhododendrons in the Wild," and there is much useful information on the cultivation of epiphytic rhododendrons, as well as descriptions of rhododendrons in various great collections in Britain.

In both these year books, domestic affairs of the enthusiasts, reports of shows, registered names of new hybrids, and so on, are included "for the record".

*R.H.*

**The Finance of Landownership.** A Policy for the Agricultural Landowner. W. WALKER-WATSON. Warne. 21s.

Gems of wisdom and knowledge, like precious stones, depend much upon their setting. Mr. Walker-Watson's book contains many valuable things : sound counsel clearly put and wide wisdom liberally given. But these touches do not stand out as they should ; they are buried in a work of good, but more common, craftsmanship.

The book would have been truer to its title and of higher quality if the author had not attempted to deal with the processes of marketing property, the principles of book-keeping and the imponderable problems of control of land use. The contribution to these subjects is either the stuff of common text-books or superficial to the point of danger.

In contrast, stand the chapters on levying loans, taxation of income and capital, insurance, Government aid, and estate companies. Here is something truly precious. If these chapters, expanded by examples from the author's wide experience, had been the sole substance of the book, it would have shone with a rare light. To appreciate the book in its present form, a reader would be well advised to open it at Chapter V.

The sub-title of the book strikes a note of expectancy. A policy is promised. The closing chapter attempts to keep the promise, but it is little more than a recapitulation of the previous chapters. Admittedly finance lies at the heart of the rural landowner's problems, and no agricultural land policy dare overlook the fact. The social, political, economic and legal considerations are, however, so many and so complex that an attempt to meet the financial problems, no matter how promising, cannot in itself be a policy for the agricultural landowner.

I look forward to the day when the many excellencies of this book are taken apart and put between two covers of their own, bearing the title "The Finance of Landownership". On that day a classic will have been born.

*D.R.D.*

**Phosphorus Metabolism, Vol. II.** Edited by WILLIAM D. MCELROY and BENTLEY GLASS. The Johns Hopkins Press and Oxford University Press. 88s.

This volume of almost one thousand pages is addressed principally to research workers and to specialist advisory officers. It will have little appeal to the farmer. But volumes such as *Phosphorus Metabolism* are essential for the performance of research work conducted in the laboratories of the various agricultural research institutes in this country, and the editors of the symposium and the publishers have performed a valuable service in presenting the work at such length. It would be invidious, and indeed impossible, to select from the large array of papers presented to the symposium any single one which stands out more markedly than any other. The problems facing the agricultural research worker can be adequately and competently answered only by the study of the findings of all workers engaged in their own specialized fields of research.

When this book was exhibited with the incoming literature in the library of one institute, eleven of the thirty research workers engaged there indicated within one week of its appearance on the shelves that they wished to have the volume for prolonged perusal at a later date!

The topics discussed at the symposium dealt with those major areas of phosphorus metabolism not covered at a previous meeting, the papers of which were published in Vol. I. They included aspects of phosphate assimilation; its role in the metabolism of amino-acids and protein, of lipids, of nucleic acids and of photo-synthetic organisms; phosphate metabolism in specialized tissues and as influenced by hormones. An admirable summary (of 90 pages) condenses the material in the papers presented.

Phosphorus is extensively involved in the metabolism of all nutrients and it yet awaits the work of some future investigator to discover the metabolic system in which phosphorus is *not* involved. It is the variety as well as the essentiality of the functions of phosphorus which stagger the comprehension. It is recorded that text-books on different aspects of the metabolism of phosphorus within the animal body still say "Calcium and phosphorus are necessary in quite large amounts to provide calcium phosphate—the important salt of which bones are formed". The understanding of the roles of phosphorus in the metabolism of plants and animals has indeed advanced a long way beyond this rudiment of physiological knowledge.

The book will be found most useful by research workers engaged in a study of the metabolism of all nutrients of both plants and animals.

*G.D.*

**Thatching of Rick and Barn.** E. J. STOWE. Landsman's Library. 3s.

There is, unfortunately, no authoritative work on thatching; a useful bibliography of articles and monographs on the subject is kept by the Librarian of the Royal Institute of British Architects, but there is no reliable standard work. Mr. Stowe's pamphlet, regrettably, does not fill the gap. He gives some interesting information about thatching ricks, the terms and the tools used; he describes the methods, but stops short of any details about ridges.

Mr. Stowe explains that the ornamental finials on ricks are called "dollies" because they look like dolls, but this is probably an over-simplification. It was a tradition in many parts of the country to fashion a straw ornament from the last sheaf of the harvest and place it in the church, where it would hang until the following year. When the next harvest was safely gathered in, the old dolly was burnt with the chaff and another dolly made from the new straw. This rite, it was supposed, ensured the continuation of the crops, and its origin in this country is probably Romano-British.

His section on barns is meagre, and it is clear that the author is on less familiar ground when dealing with roof thatching, which is the more complicated branch of the thatcher's craft. The fundamental difference between the method of thatching with long straw and the technique required for combed wheat reed or Norfolk reed is nowhere explained. Mr. Stowe points out that rotten straw must be completely removed when repairing a barn roof, but he offers no information on how the new coat is to be attached if the previous layer has had to be discarded.

Thatching is an ancient and an honourable craft which deserves something more than summary treatment.

*J.N.W.*

**Skill in Country Workshops.** Rural Industries Bureau. 1s.

Rural crafts are demanding more skill than ever before, and the Rural Industries Bureau have given a very apt title to the report of their activities from April 1952 to March 1953.

Arts such as textile-making and basketry are reported upon, but the first, and longest, section is on blacksmithing and agricultural engineering. Rural mechanics are anxious to get training in the repair of the more complicated farm equipment, such as combine harvesters and pick-up balers, and for some years the Bureau has been sending out itinerant instructors to teach engineers in their own shops; it has also arranged residential courses lasting up to five days. During the year under review, the demands for these methods of instruction far outstripped the Bureau's resources, though twenty-eight residential courses were held on the subject of combine harvesters and pick-up balers alone. Some of these courses took place at farm institutes and some at the Bureau's training centre at Wimbledon.

It is refreshing to read of the training of new recruits to rural engineering, and equally refreshing to note the slight increase during the year in the number of apprentices entered under the National Joint Apprenticeship Scheme for the farriers' and blacksmiths' trade.

The retention and development of some of the crafts referred to in the report are not likely to be of direct use to farming, but there is one that is vitally important—that is, the making of drainage pipes. Some of the firms which concentrated on making drainage pipes during the war have returned to brick-making, and this has left a gap in production which could have serious results on our farm productivity. This need has led to a prosperous time for rural pipe-makers.

The main function of the Bureau in relation to rural craftsmen is to instruct, advise and encourage, but through the Rural Industries Loan Fund Limited it can go further. It can give practical help to the craftsman to raise the capital needed to buy the additional equipment which the Bureau considers necessary to bring his shop up to date.

*H.J.H.*

**Making Money from Pigs.** JOHN LUSCOMBE. Dairy Farmer. 12s. 6d.

John Luscombe is the Lecturer in Animal Husbandry at Harper Adams Agricultural College, and this book is based on his work with the pig unit there. It is full of useful material – the chapter on "Pigmanship" containing many useful hints – but in one or two places the sense that the author wishes to convey is not clear. Thus on page 77, and again on page 80, it appears as if overfeeding and symptoms of ill-health only arise with twice feeding. A printer's error of 10 lb., where 100 lb. is obviously meant, will no doubt be corrected in future editions.

At times, too, the treatment of a subject is rather sketchy ; for example, one would have liked to have read more about the results being obtained in the Harper Adams pig parlour. Nevertheless, the book is attractively prepared, it is very readable, and has many good illustrations and line drawings. It should prove a useful addition to both farmers' and students' libraries.

*J.W.R.*



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